FCC PART 27

FCC PART 22H, PART 24E

MEASUREMENT AND TEST REPORT

For

Micron Electronics LLC.

1001 Yamato Road, Suite 400, Boca Raton, Florida, United States

FCC ID: ZKQ-BTM

Report Type:	**Product Type:**
Original Report	Bolt Mini

Test Engineer:	Edison Hu Edison.hu
Report Number:	RSHA170828003-00C
Report Date:	2017-10-10
Reviewed By:	Oscar Ye RF Leader Oscar.Ye
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan, Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Micron Electronics LLC.
Tested Model	GT200
Product Type	Bolt Mini
Dimension	110 mm(L)×58 mm(W)×30 mm(H)
Power Supply	DC 3.6V from Lithium Non-rechargeable Battery

**All measurement and test data in this report was gathered from production sample serial number: 20170828003. (Assigned by BACL, Kunshan). The EUT was received on 2017-08-28.*

Objective

This type approval report is prepared on behalf of Micron Electronics LLC. in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E and Part 27 of the Federal Communication Commission's rules.

The objective is to determine the compliance of 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)

FCC Part15.247 DTS submissions with FCC ID: ZKQ-BTM.

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
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D.

All radiated and conducted emissions measurements were 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
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.05dB
	1GHz~6GHz	4.48dB
	6GHz~18GHz	5.22dB
	18GHz~40GHz	4.94dB
Occupied Bandwidth		0.5kHz
Frequency Stability		1Hz
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 No.248 Chenghu Road,Kunshan,Jiangsu province,China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. 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

Justification

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 modifications were made to the EUT.

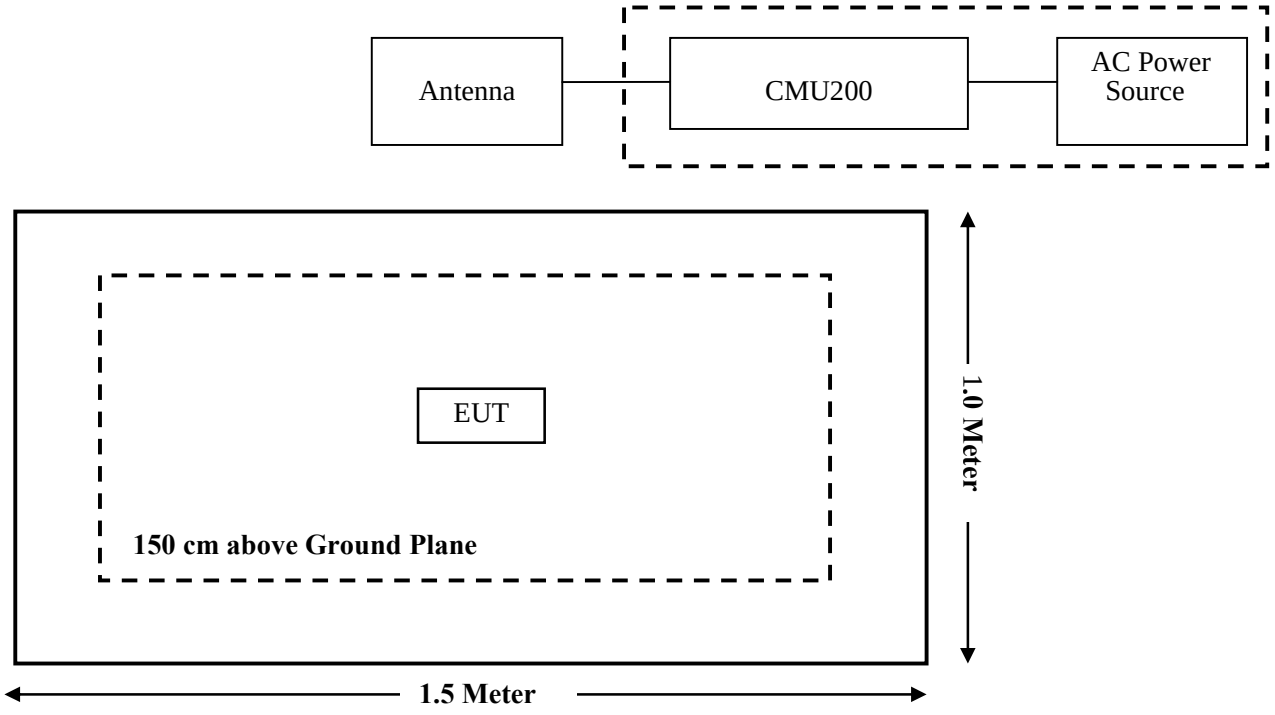
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Shielding Type	Length (m)	From Port	To
/	/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §1.1307 (b) (1) & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§2.1046; § 22.913 (a); § 24.232 (c); §27.50 (d)	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)	Spurious Radiated Emissions	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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
HP	Signal Generator	HP 8341B	2624A00116	2017-08-29	2018-08-28
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Sonoma Instrument	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2016-11-25	2017-11-24
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
HP	Signal Generator	HP 8341B	2624A00116	2017-08-29	2018-08-28
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-12
ETS-LINDGREN	Horn Antenna	3116	2516	2016-12-12	2019-12-12
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2016-11-25	2017-11-24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	FSV40 Signal Analyzer	FSV40	101116	2017-07-22	2018-07-21
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2016-11-25	2017-11-24
BACL	Temperature & Humidity Chamber	BTH-150	30023	2016-10-10	2017-10-09
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	/	/
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
Micron	RF Cable	N/A	N/A	2017-09-13	2018-09-12

*** 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 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f^2)	30
30-300	27.5	0.073	0.2	30
300-1500	/		f/1500	30
1500-100,000	/		1.0	30

f = frequency in MHz;

* = Plane-wave equivalent power density

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		Target Output Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)	MPE Ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11b	2412~2462	0.0	1.00	14.00	25.12	20	0.0050	1.00	0.0050
802.11g		0.0	1.00	12.50	17.78	20	0.0035	1.00	0.0035
802.11n-HT20		0.0	1.00	13.00	19.95	20	0.0040	1.00	0.0040
GPRS 850	824~849	0.5	1.12	26.50	446.68	20	0.0997	0.57	0.1749
EDGE 850	824~849	0.5	1.12	24.50	281.84	20	0.0629	0.57	0.1104
WCDMA Band V	824~849	0.5	1.12	22.50	177.83	20	0.0397	0.57	0.0696
GPRS 1900	1850~1910	1.0	1.26	22.50	177.83	20	0.0445	1.00	0.0445
EDGE 1900	1850~1910	1.0	1.26	23.00	199.53	20	0.0500	1.00	0.0500
WCDMA Band II	1850~1910	1.0	1.26	22.00	158.49	20	0.0397	1.00	0.0397
WCDMA Band IV	1710-1755	1.0	1.26	22.00	158.49	20	0.0397	1.00	0.0397

For GPRS mode, the time based average power is relevant, the difference in between depends on the duty cycle of the TDMA signal.

Number of Time slot	1	2	3	4
Duty Cycle	1:8.3	1:4.15	1:2.77	1:2.08
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.26 dB	-3 dB

Note:

(1) The target output powers are all declared by the Manufacturer.

(2) Wi-Fi and GPRS or WCDMA mode support transmit simultaneously, the worst case (802.11b of Wi-Fi & GPRS 850) is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.0050/1.00+0.0997/0.57=0.0050+0.1749=0.1799 < 1.0$$

Result: The device meet FCC MPE at 20 cm distance.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d) , Part 22H & 24E, Part 27 there 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 Standards

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

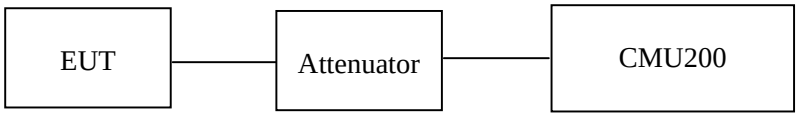
According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

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.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

Conducted Power

Cellular Band (Part 22H)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	31.95	31.31	29.78	28.76	38.45
	190	836.6	32.00	31.41	29.88	28.86	38.45
	251	848.8	32.13	31.52	30.00	29.15	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EDGE	128	824.2	26.66	26.66	26.61	26.57	38.45
	190	836.6	26.81	26.80	26.71	26.68	38.45
	251	848.8	27.11	27.00	27.00	26.93	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		21.99	22.05	21.95
		Rel 6 HSDPA	1	21.82	22.00	21.80
			2	21.79	21.86	21.79
			3	21.90	21.93	21.86
			4	21.76	21.93	21.90
		Rel 6 HSUPA	1	21.70	21.86	21.69
			2	21.82	21.76	21.86
			3	21.75	21.90	21.78
			4	21.88	22.03	21.73
			5	21.75	21.99	21.93
		HSPA+	1	21.63	21.76	21.55

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	28.64	28.10	26.44	25.42	33
	661	1880.0	28.33	27.72	26.01	25.00	33
	810	1909.8	28.20	27.63	25.81	24.81	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EDGE	512	1850.2	25.52	25.42	25.43	25.38	33
	661	1880.0	25.14	25.24	25.12	25.11	33
	810	1909.8	24.98	24.91	24.92	25.90	33

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	Rel 99	1	21.20	21.19	20.93
		Rel 6 HSDPA	1	21.05	20.99	20.89
			2	21.19	21.11	20.87
			3	21.20	21.08	20.86
			4	21.00	21.05	20.63
		Rel 6 HSUPA	1	21.08	21.16	20.73
			2	21.05	21.05	20.82
			3	20.94	21.15	20.78
			4	21.05	20.99	20.77
			5	20.94	21.07	20.71
		HSPA+	1	20.45	20.62	20.43

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	Rel 99	1	21.21	21.03	20.16
		Rel 6 HSDPA	1	21.03	20.81	20.72
			2	21.07	21.09	20.24
			3	21.16	21.27	20.73
			4	21.05	21.25	20.75
		Rel 6 HSUPA	1	21.16	21.34	20.82
			2	21.08	21.14	20.73
			3	20.72	21.08	20.68
			4	21.03	20.73	20.65
			5	20.85	21.24	20.73
		HSPA+	1	20.36	20.37	20.56

Peak-to-average ratio (PAR)

Cellular Band

Mode	Channel	PAR (dB)	Limit (dB)
GPRS	Low	6.46	13
	Middle	6.91	13
	High	6.99	13

Mode	Channel	PAR (dB)	Limit (dB)
EDGE	Low	8.63	13
	Middle	9.05	13
	High	9.25	13

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA Band V (QPSK)	Low	3.22	13
	Middle	3.19	13
	High	2.97	13
HSDPA (16QAM)	Low	2.83	13
	Middle	2.76	13
	High	2.53	13
HSUPA (QPSK)	Low	2.72	13
	Middle	2.79	13
	High	2.69	13
HSPA+ (16QAM)	Low	2.57	13
	Middle	2.44	13
	High	2.34	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GPRS	Low	6.46	13
	Middle	6.51	13
	High	6.69	13

Mode	Channel	PAR (dB)	Limit (dB)
EDGE	Low	6.33	13
	Middle	6.48	13
	High	6.88	13

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA Band II (QPSK)	Low	3.16	13
	Middle	3.04	13
	High	2.93	13
HSDPA (16QAM)	Low	2.49	13
	Middle	2.37	13
	High	2.39	13
HSUPA (QPSK)	Low	2.43	13
	Middle	2.30	13
	High	2.36	13
HSPA+ (16QAM)	Low	2.27	13
	Middle	2.20	13
	High	2.11	13

AWS Band (Part 27)

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA Band IV (QPSK)	Low	3.14	13
	Middle	3.03	13
	High	2.91	13
HSDPA (16QAM)	Low	2.48	13
	Middle	2.36	13
	High	2.32	13
HSUPA (QPSK)	Low	2.41	13
	Middle	2.31	13
	High	2.34	13
HSPA+ (16QAM)	Low	2.26	13
	Middle	2.21	13
	High	2.12	13

Radiated Power

GPRS Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted. Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
Cellular Band (Part 22H), Middle Channel										
836.60	96.91	134	163	H	33.70	0.63	-1.14	31.93	38.45	6.52
836.60	91.88	336	171	V	28.67	0.63	-1.14	26.90	38.45	11.55
PCS Band (Part 24E), Middle Channel										
1880.00	91.23	16	182	H	20.19	0.85	8.81	28.15	33.00	4.85
1880.00	89.87	332	147	V	18.83	0.85	8.81	26.79	33.00	6.21

EDGE Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
Cellular Band (Part 22H), Middle Channel										
836.60	91.62	57	142	H	28.41	0.63	-1.14	26.64	38.45	11.81
836.60	88.49	245	168	V	25.28	0.63	-1.14	23.51	38.45	14.94
PCS Band (Part 24E), Middle Channel										
1880.00	88.12	228	210	H	17.08	0.85	8.81	25.04	33.00	7.96
1880.00	86.64	134	167	V	15.60	0.85	8.81	23.56	33.00	9.44

WCDMA Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
WCDMA Band V (Part 22H), Middle Channel										
836.60	86.94	253	135	H	23.73	0.63	-1.14	21.96	38.45	16.49
836.60	85.86	23	172	V	22.65	0.63	-1.14	20.88	38.45	17.57
WCDMA Band II (Part 24E), Middle Channel										
1880.00	85.38	10	159	H	14.25	1.40	6.72	19.57	33.00	13.43
1880.00	82.26	170	176	V	11.17	1.40	6.72	16.49	33.00	16.51
WCDMA Band IV (Part 27), Middle Channel										
1732.60	85.71	253	168	H	13.63	0.84	8.57	21.36	30.00	8.64
1732.60	85.12	23	179	V	13.04	0.84	8.57	20.77	30.00	9.23

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

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

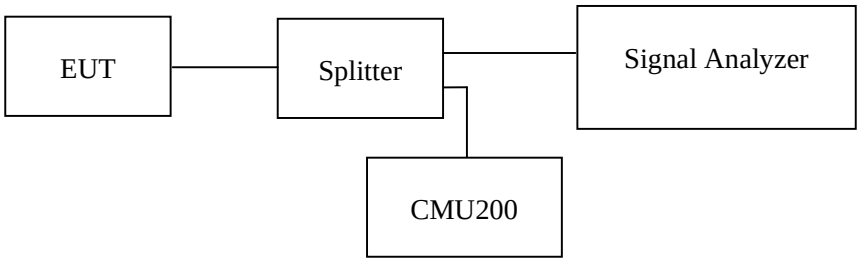
Applicable Standards

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 (Cellular /PCS) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

EUT operation mode: Transmitting

Test Result: Compliance.

Cellular Band (Part 22H)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS(GMSK)	836.6	244.57	318.40
EDGE(8PSK)	836.6	241.68	316.90

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA Band V(QPSK)	836.6	4.15	4.67

PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS(GMSK)	1880.0	243.13	319.80
EDGE(8PSK)	1880.0	244.57	316.09

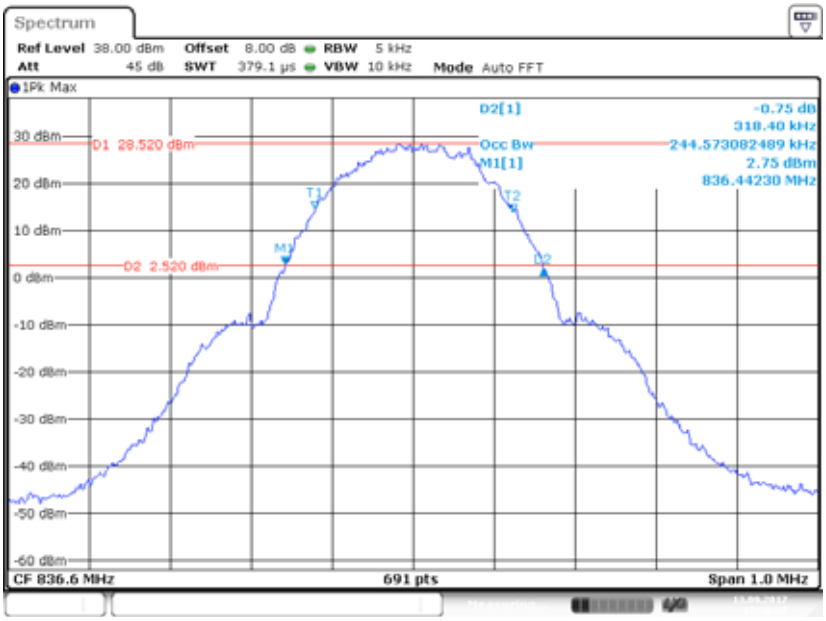
Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA Band II(QPSK)	1880.0	4.17	4.69

AWS Band (Part 27)

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA Band IV(QPSK)	1732.6	4.15	4.69

Cellular Band (Part 22H)

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



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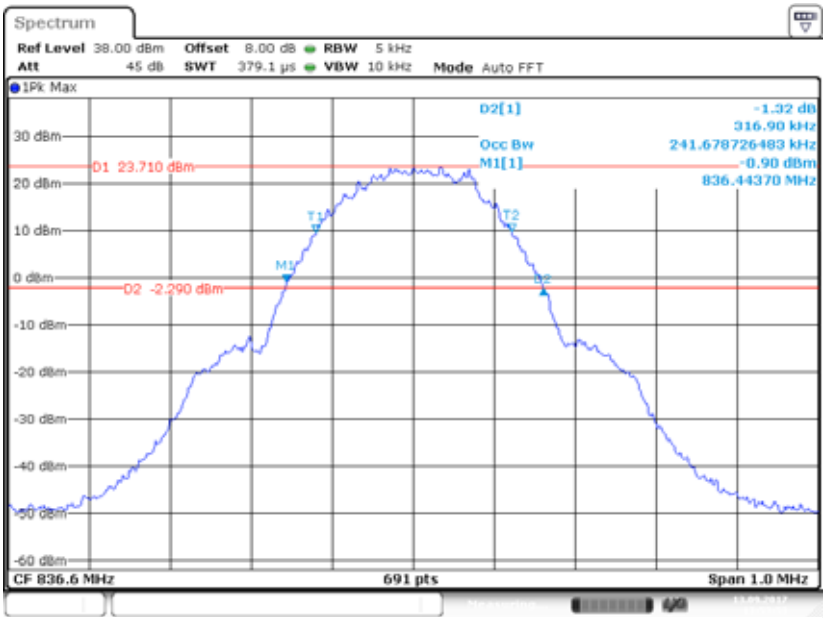
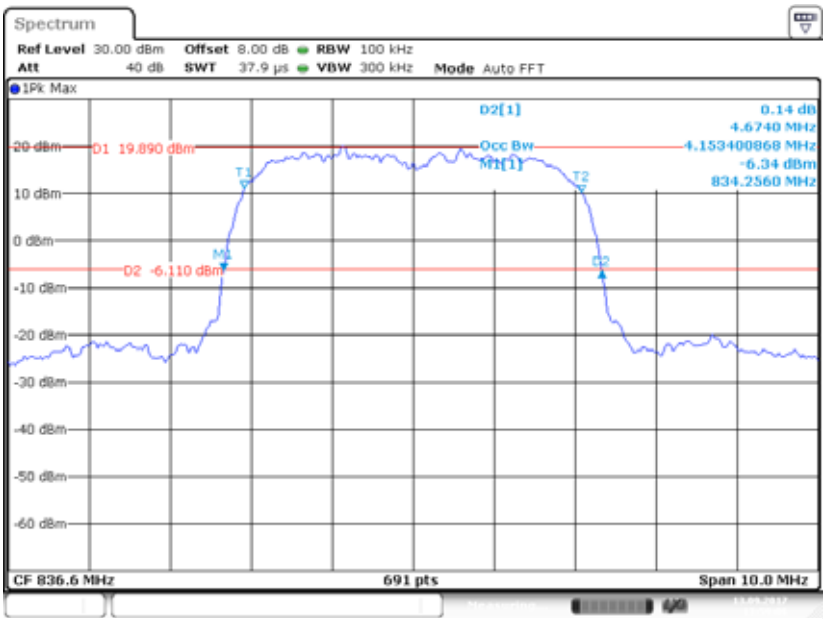
99% Occupied & 26 dB Emissions Bandwidth for EDGE Mode



Date: 13.SEP.2017 13:53:53

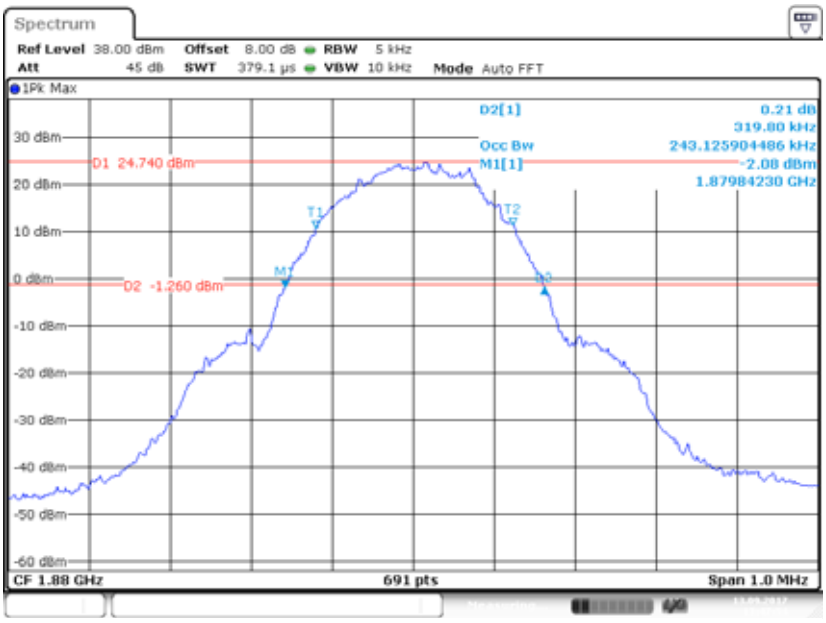
99% Occupied & 26 dB Emissions Bandwidth for WCDMA Band V



Date: 13.SEP.2017 13:59:07

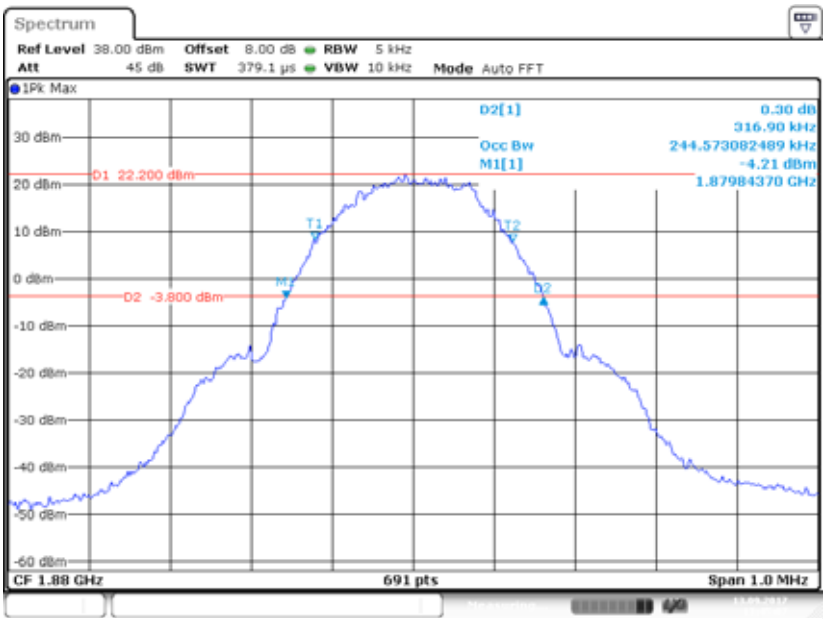
PCS Band (Part 24E)

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



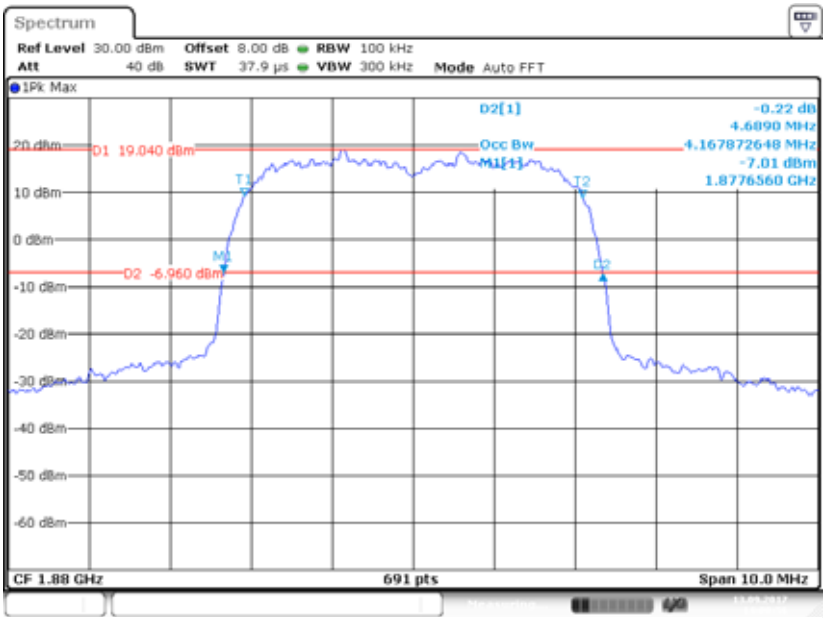
Date: 13.SEP.2017 13:47:54

99% Occupied & 26 dB Emissions Bandwidth for EDGE Mode



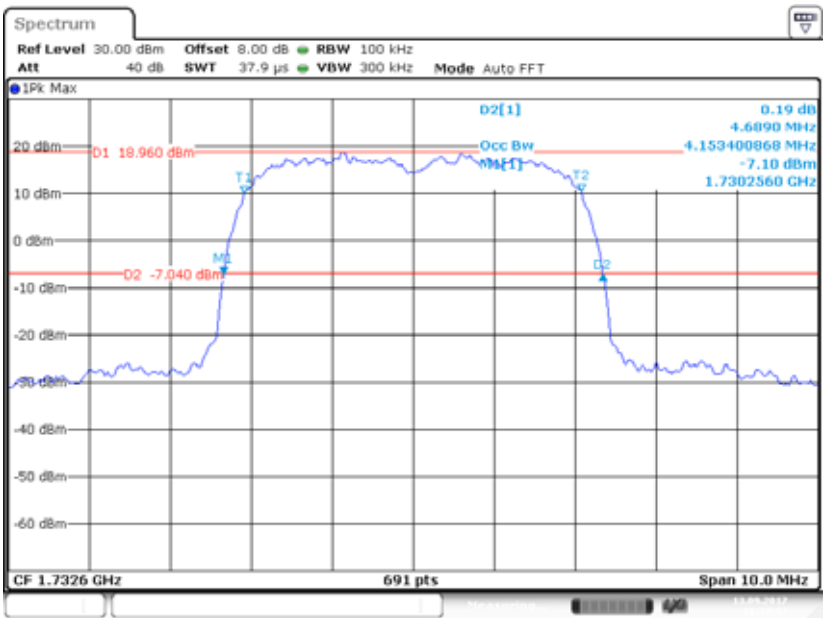
Date: 13.SEP.2017 13:45:07

99% Occupied & 26 dB Emissions Bandwidth for WCDMA Band II



Date: 13.SEP.2017 14:00:56

99% Occupied & 26 dB Emissions Bandwidth for WCDMA Band IV



Date:13.SEP.2017 16:13:33

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

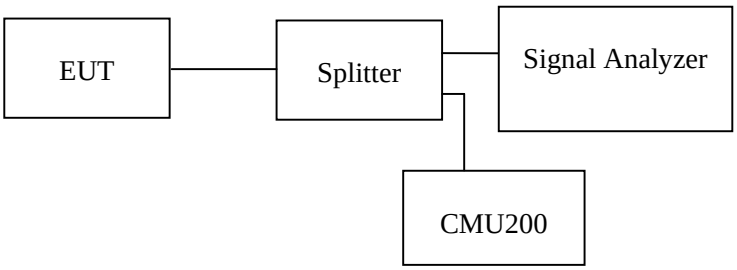
Applicable Standards

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 100 kHz 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

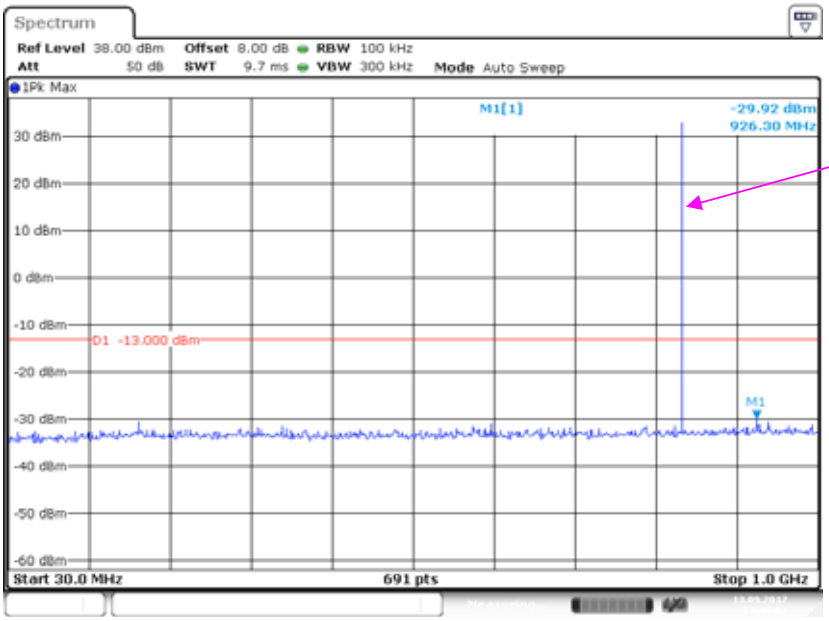
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

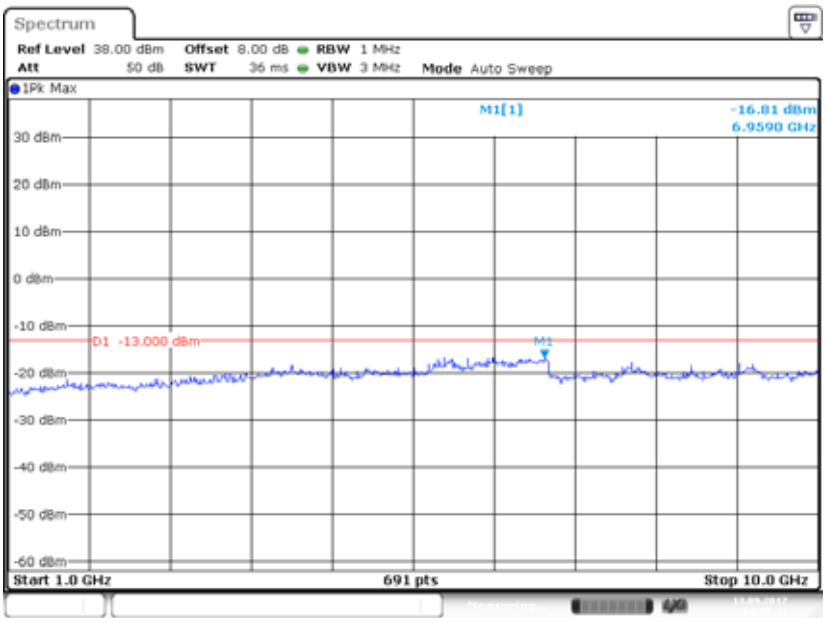
Cellular Band (Part 22H)

30 MHz – 1 GHz (GPRS Mode)



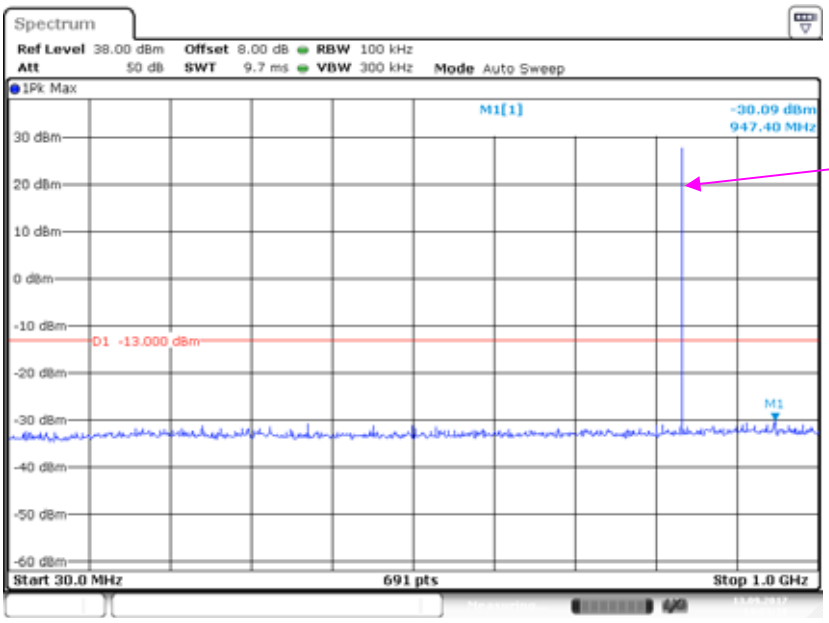
Date: 13.SEP.2017 14:39:01

1 GHz – 10 GHz (GPRS Mode)



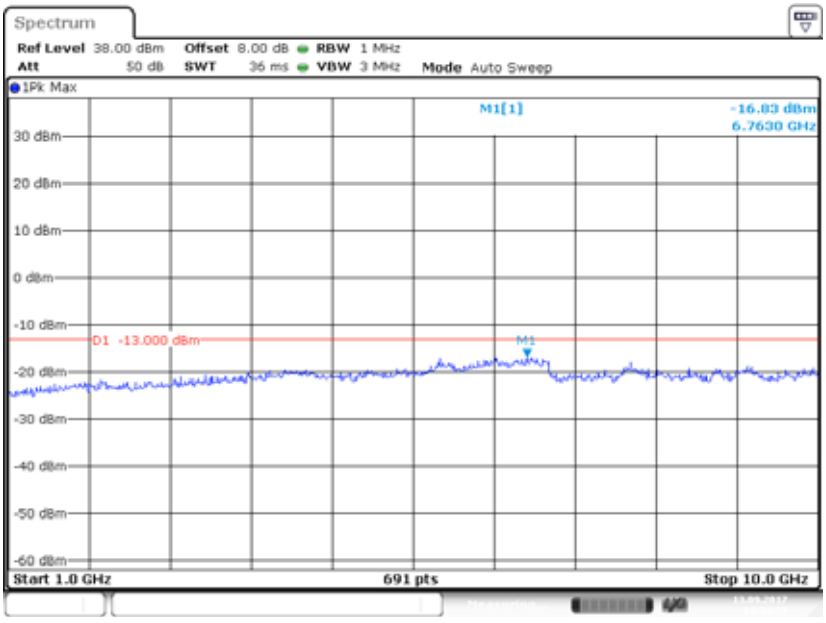
Date: 13.SEP.2017 14:37:13

30 MHz – 1 GHz (EDGE Mode)



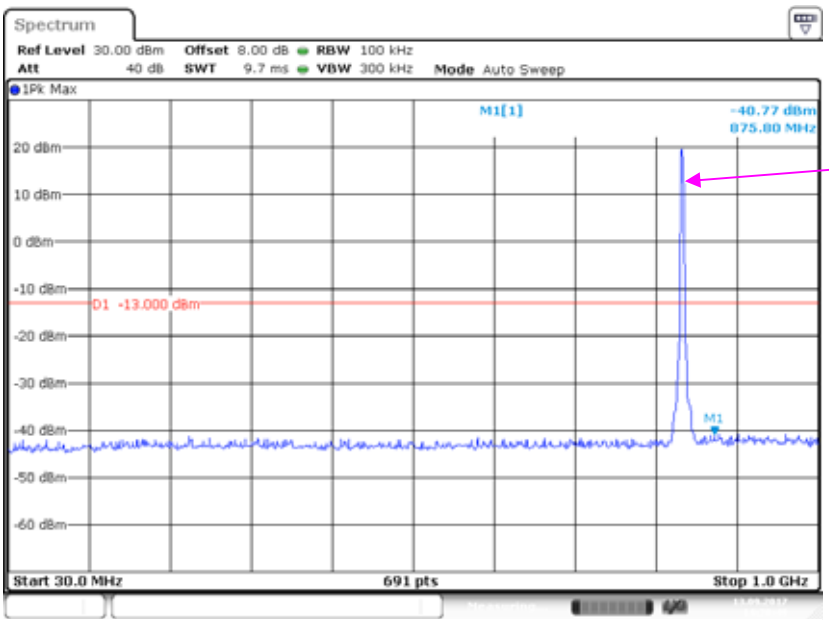
Date: 13.SEP.2017 14:33:18

1 GHz – 10 GHz (EDGE Mode)



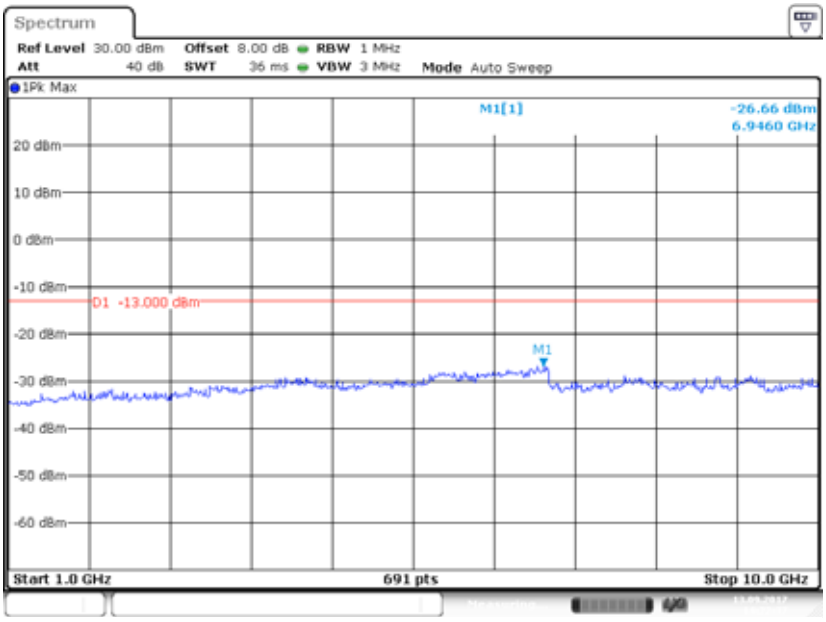
Date: 13.SEP.2017 14:35:00

30 MHz – 1GHz(WCDMA Band V)



Date: 13.SEP.2017 14:28:49

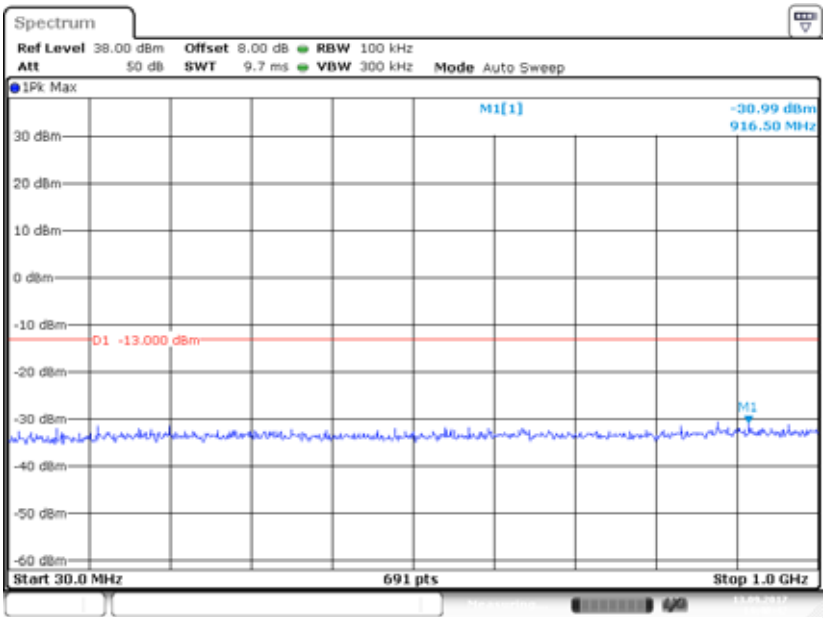
1 GHz – 10 GHz (WCDMA Mode) Band V



Date: 13.SEP.2017 14:22:37

PCS Band (Part 24E)

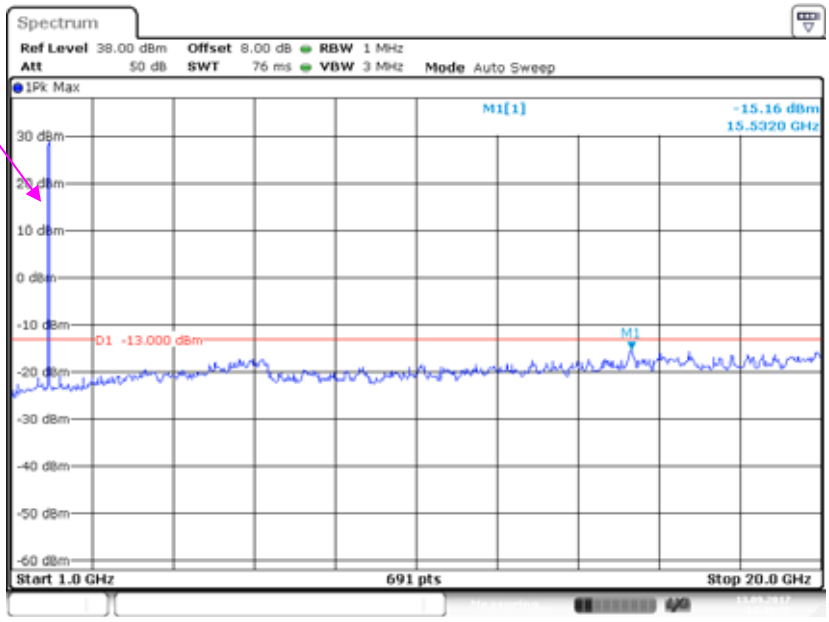
30 MHz – 1 GHz (GPRS Mode)



Date: 13.SEP.2017 14:40:42

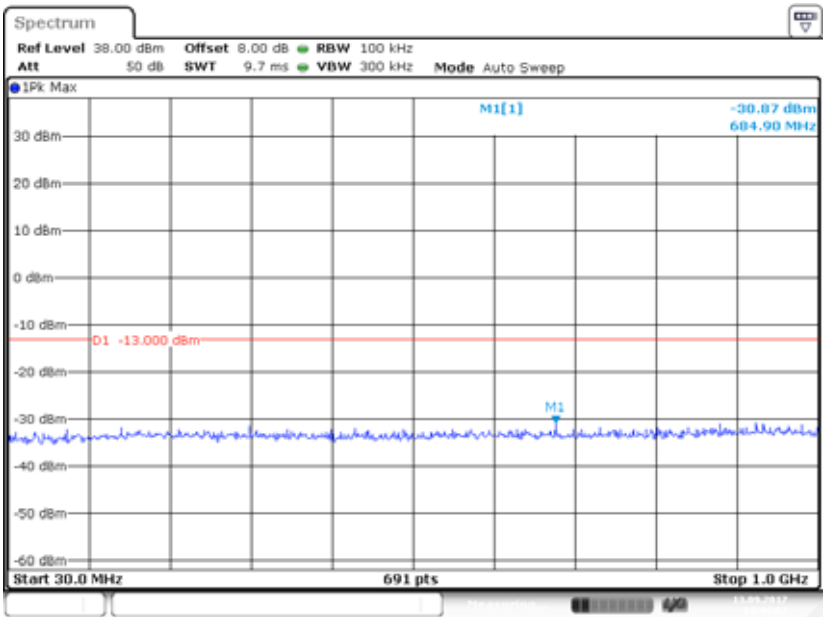
1 GHz – 20 GHz (GPRS Mode)

Fundamental



Date: 13.SEP.2017 14:41:25

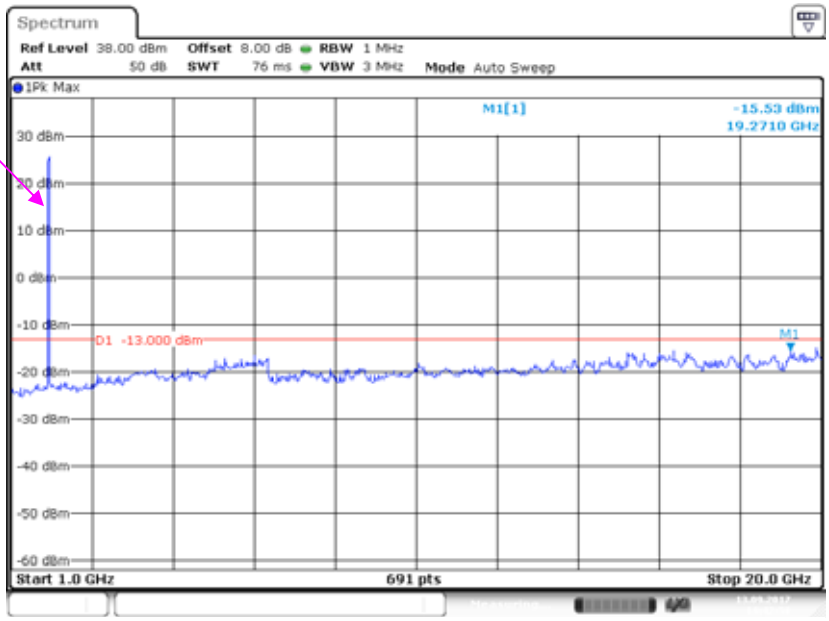
30 MHz – 1 GHz (EDGE Mode)



Date: 13.SEP.2017 14:44:03

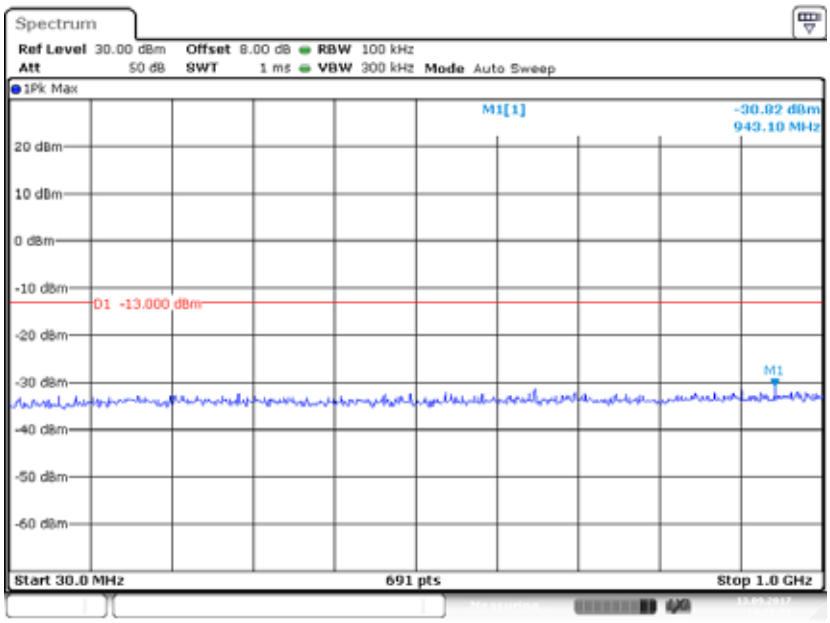
1 GHz – 20 GHz (EDGE Mode)

Fundamental



Date: 13.SEP.2017 14:42:49

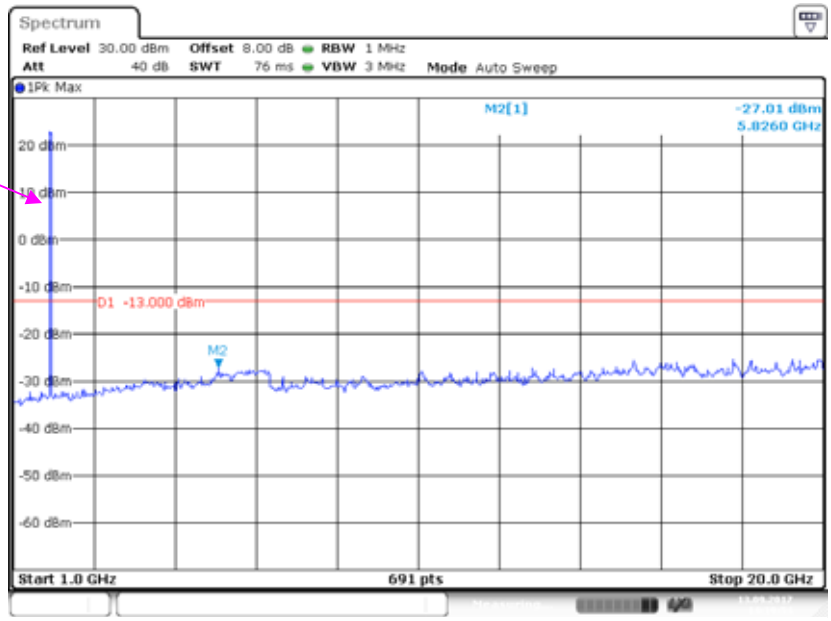
30 MHz – 1 GHz (WCDMA Mode) Band II



Date:13.SEP.2017 14:21:02

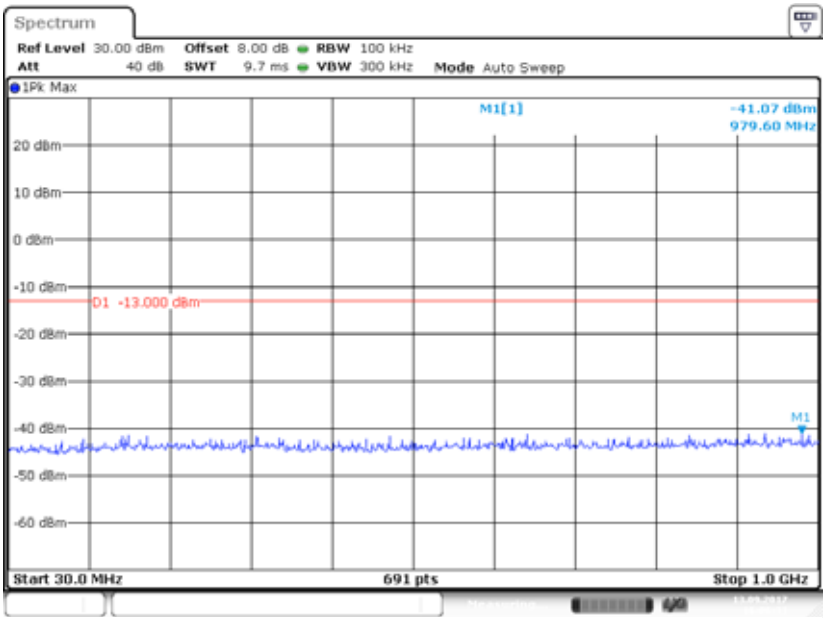
1 GHz – 20 GHz (WCDMA Mode) Band IV

Fundamental



Date:13.SEP.2017 14:19:54

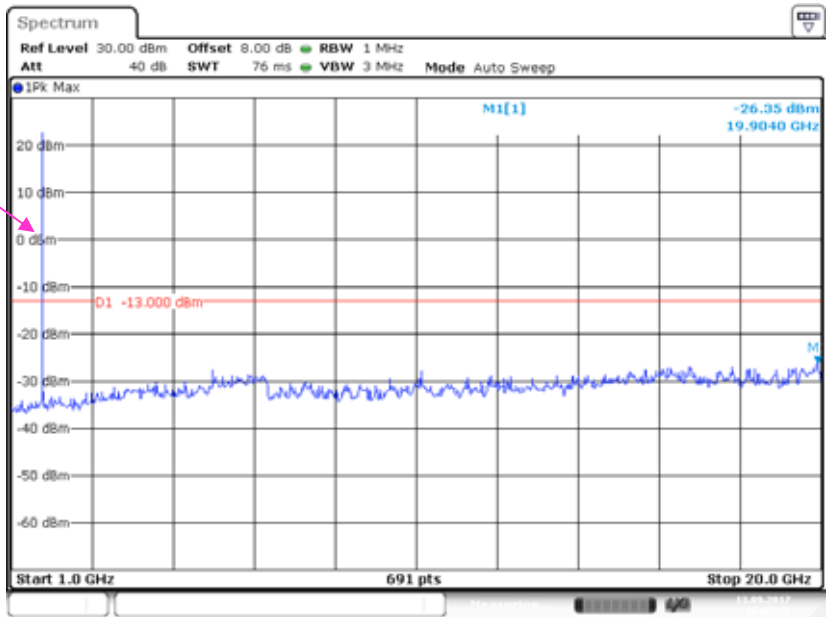
30 MHz – 1 GHz (WCDMA Mode) Band IV



Date: 13.SEP.2017 16:06:31

1 GHz – 20 GHz (WCDMA Mode) Band IV

Fundamental



Date: 13.SEP.2017 16:05:49

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

Applicable Standards

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

22.917 (a) Out of band emissions. 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.

24.238 (a) Out of band emissions. 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.

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 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)

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

Test mode: Transmitting (Pre-scan with Low, Middle, High channel, and the worse case data 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 (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
GPRS Mode, Middle channel										
475.55	34.67	131	157	H	-66.17	0.55	-1.80	-68.52	-13	55.52
475.55	31.61	46	168	V	-69.23	0.55	-1.80	-71.58	-13	58.58
1673.20	38.25	310	173	H	-72.70	0.84	8.48	-65.06	-13	52.06
1673.20	38.04	154	182	V	-72.91	0.84	8.48	-65.27	-13	52.27
2509.80	39.75	343	163	H	-68.87	0.89	10.09	-59.67	-13	46.67
2509.80	39.46	205	183	V	-69.16	0.89	10.09	-59.96	-13	46.96
WCDMA Band V, Middle channel										
475.55	37.63	146	187	H	-63.21	0.55	-1.80	-65.56	-13	52.56
475.55	35.72	309	210	V	-65.12	0.55	-1.80	-67.47	-13	54.47
1673.20	37.45	284	196	H	-73.50	0.84	8.48	-65.86	-13	52.86
1673.20	37.39	105	164	V	-73.56	0.84	8.48	-65.92	-13	52.92
2509.80	43.66	279	169	H	-64.96	0.89	10.09	-55.76	-13	42.76
2509.80	43.54	101	157	V	-65.08	0.89	10.09	-55.88	-13	42.88

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 (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
GPRS Mode, Middle channel										
475.55	34.43	62	147	H	-66.41	0.55	-1.80	-68.76	-13	55.76
475.55	31.43	177	158	V	-69.41	0.55	-1.80	-71.76	-13	58.76
3760.00	47.44	212	167	H	-56.25	0.95	9.74	-47.46	-13	34.46
3760.00	50.24	77	220	V	-53.45	0.95	9.74	-44.66	-13	31.66
5640.00	48.64	194	187	H	-51.87	1.15	10.47	-42.55	-13	29.55
5640.00	48.44	204	176	V	-52.07	1.15	10.47	-42.75	-13	29.75
WCDMA Band II, Middle channel										
475.55	36.82	320	137	H	-64.02	0.55	-1.80	-66.37	-13	53.37
475.55	34.73	42	196	V	-66.11	0.55	-1.80	-68.46	-13	55.46
3760.00	47.64	345	185	H	-56.05	0.95	9.74	-47.26	-13	34.26
3760.00	47.45	153	160	V	-56.24	0.95	9.74	-47.45	-13	34.45
5640.00	60.74	126	196	H	-39.77	1.15	10.47	-30.45	-13	17.45
5640.00	60.54	265	241	V	-39.97	1.15	10.47	-30.65	-13	17.65

AWS Band (Part 27)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Submitted Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
WCDMA Band IV, Middle channel										
475.55	36.67	320	168	H	-64.17	0.55	-1.80	-66.52	-13	53.52
475.55	34.42	42	180	V	-66.42	0.55	-1.80	-68.77	-13	55.77
3465.2	47.78	345	150	H	-57.01	0.93	9.87	-48.07	-13	35.07
3465.2	47.65	153	183	V	-57.14	0.93	9.87	-48.20	-13	35.20
5197.8	60.74	126	175	H	-41.34	1.10	10.30	-32.14	-13	19.14
5197.8	60.44	265	190	V	-41.64	1.10	10.30	-32.44	-13	19.44

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

Applicable Standards

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.

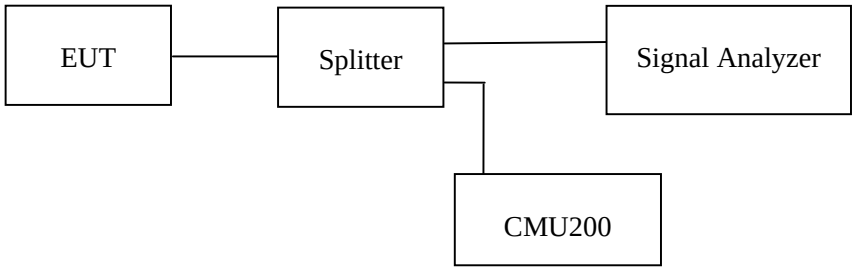
According to FCC §27.53 (h)(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

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

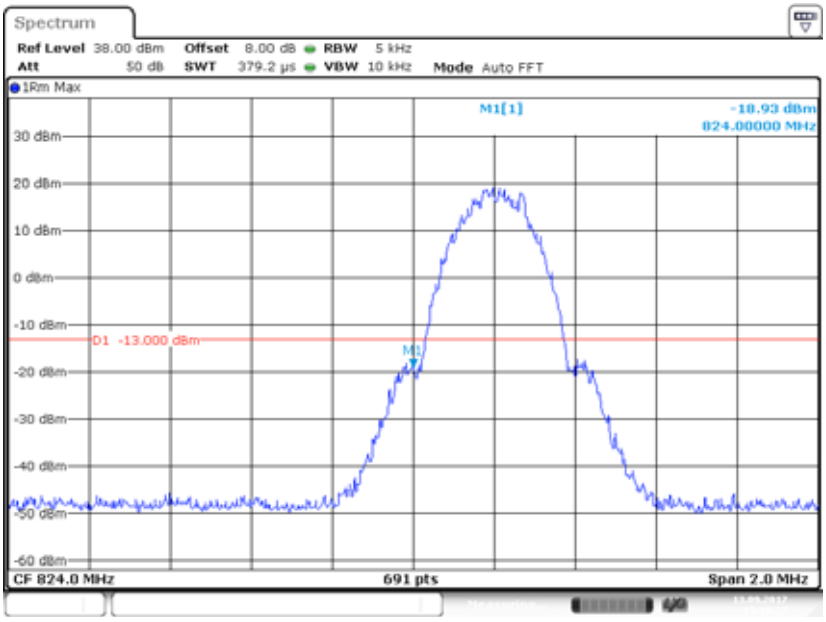
Temperature:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

EUT operation mode: Transmitting

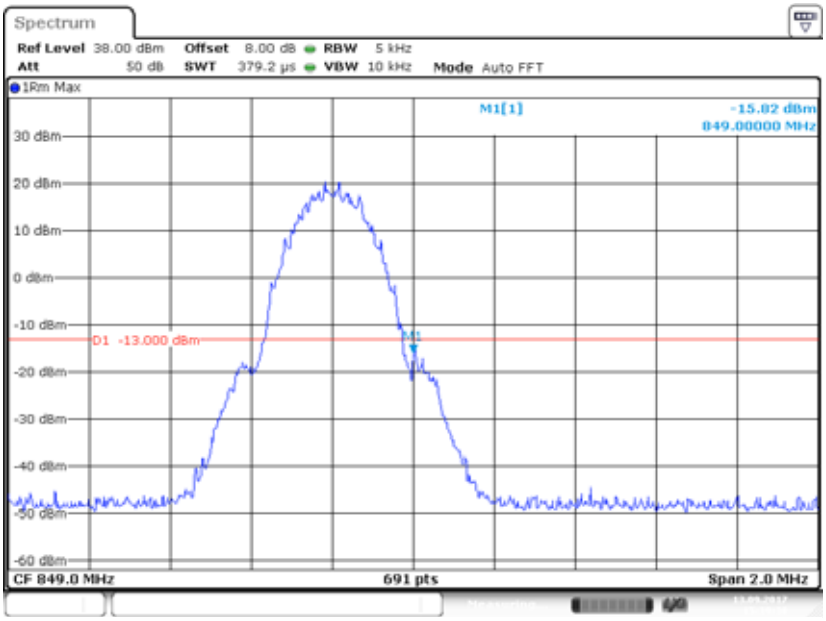
Test Result: Compliance.

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



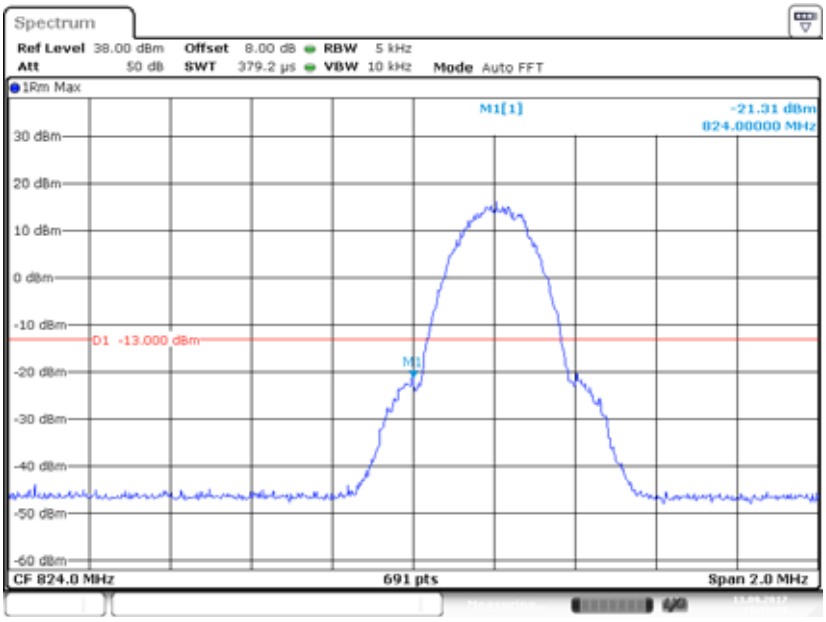
Date:13.SEP.2017 15:18:28

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



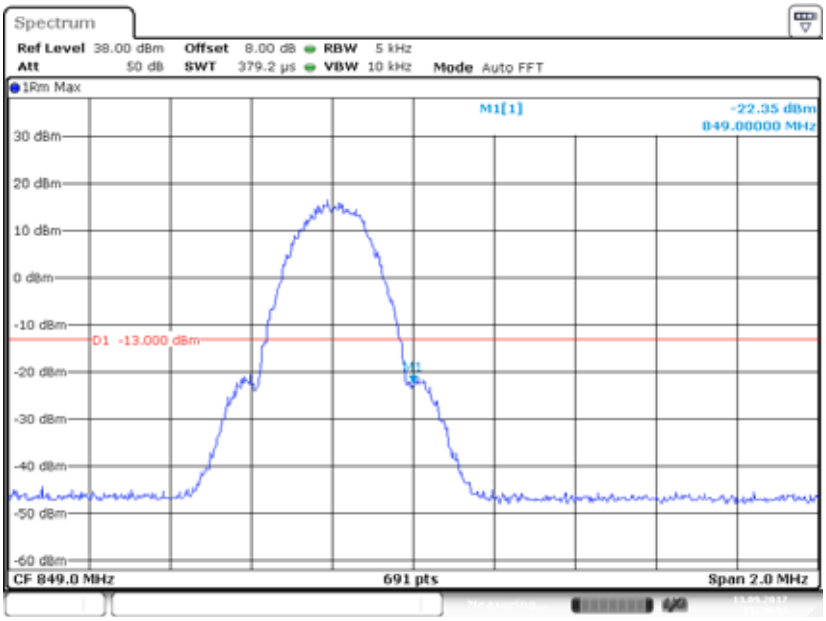
Date:13.SEP.2017 15:19:10

Cellular Band, Left Band Edge for EDGE Mode



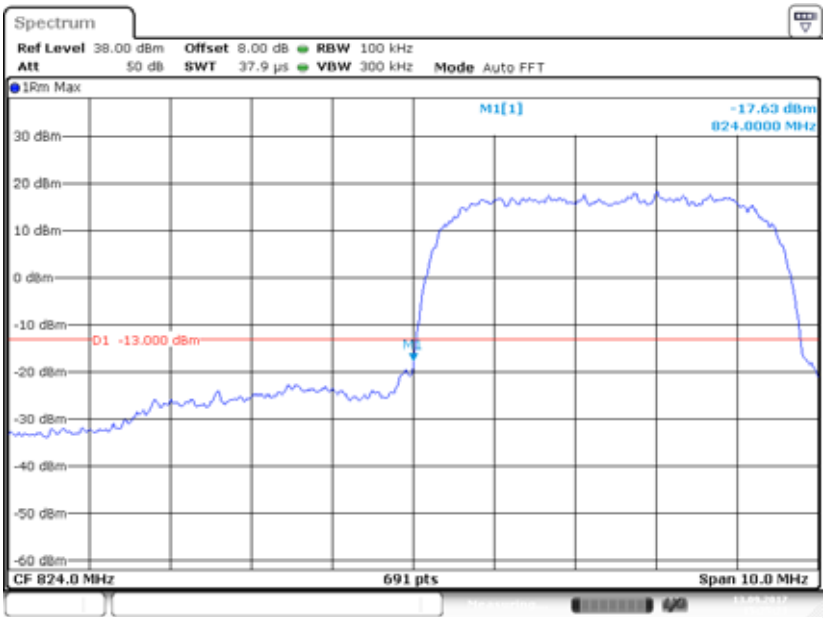
Date:13.SEP.2017 15:21:38

Cellular Band, Right Band Edge for EDGE Mode



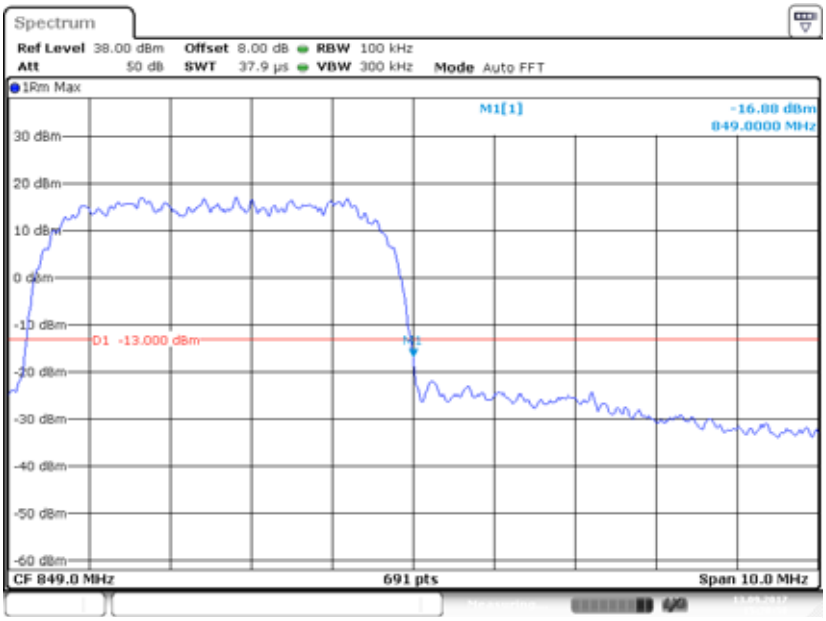
Date:13.SEP.2017 15:20:55

Cellular Band, Left Band Edge for WCDMA Band V



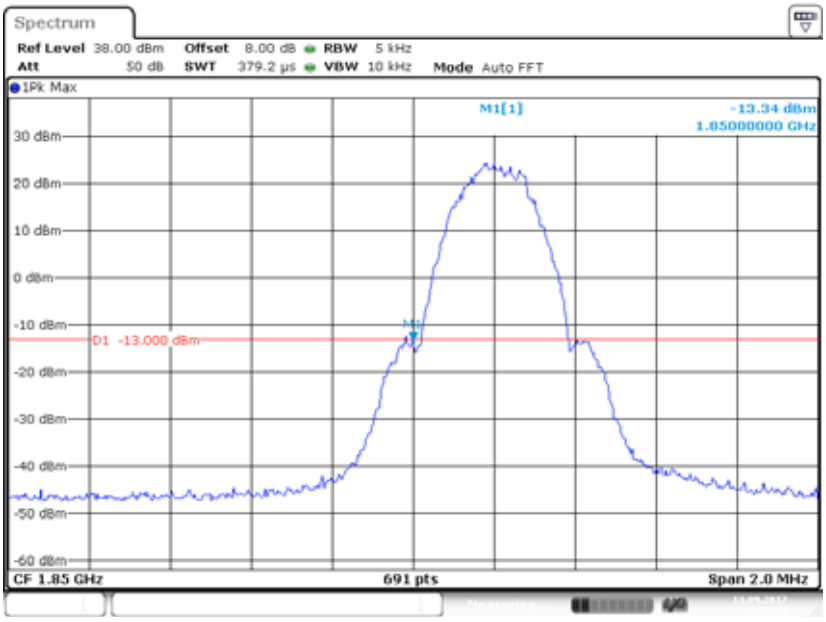
Date: 13.SEP.2017 15:25:23

Cellular Band, Right Band Edge for WCDMA Band V



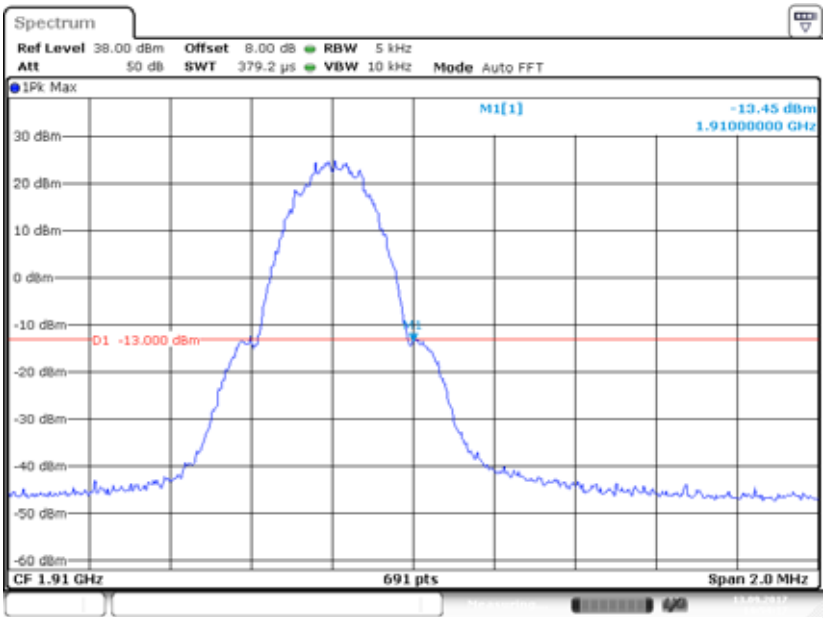
Date: 13.SEP.2017 15:28:51

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



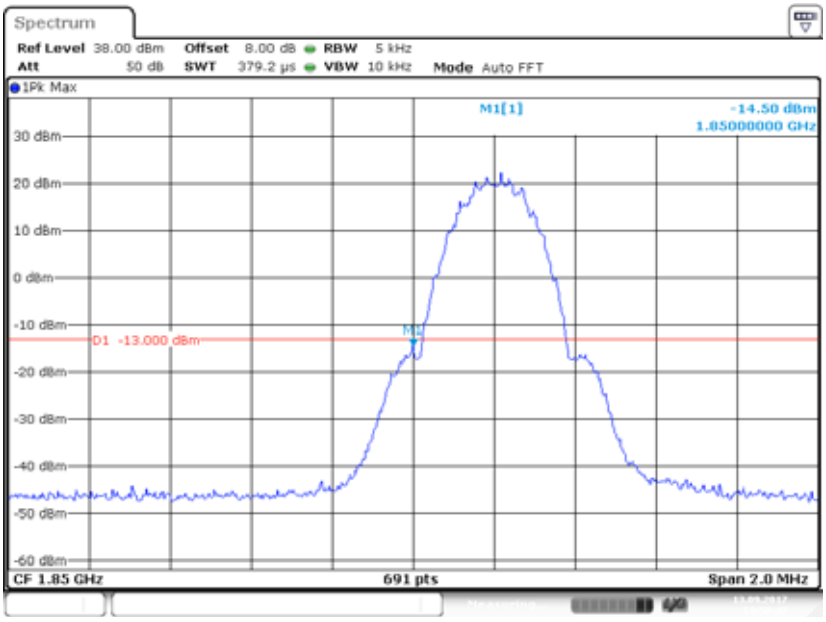
Date: 13.SEP.2017 14:57:35

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



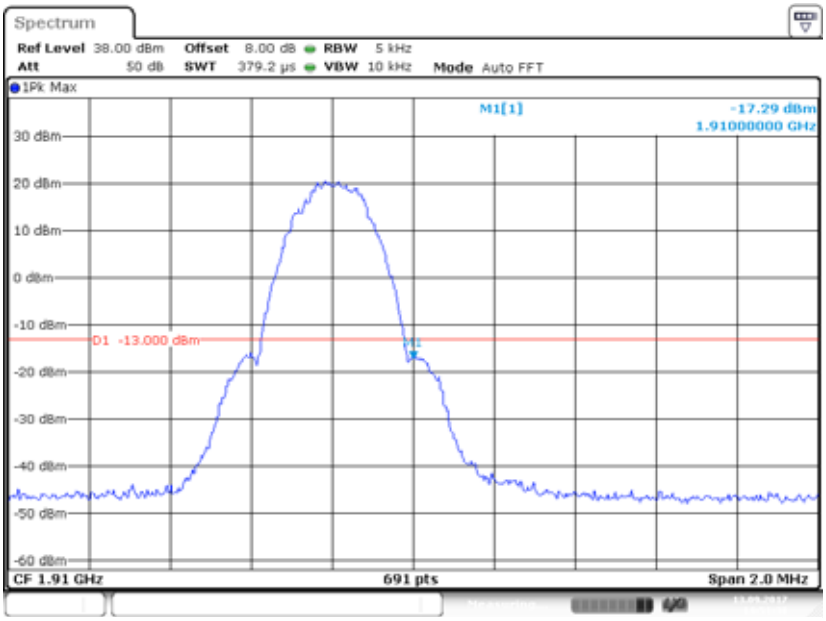
Date: 13.SEP.2017 14:54:18

PCS Band, Left Band Edge for EDGE Mode



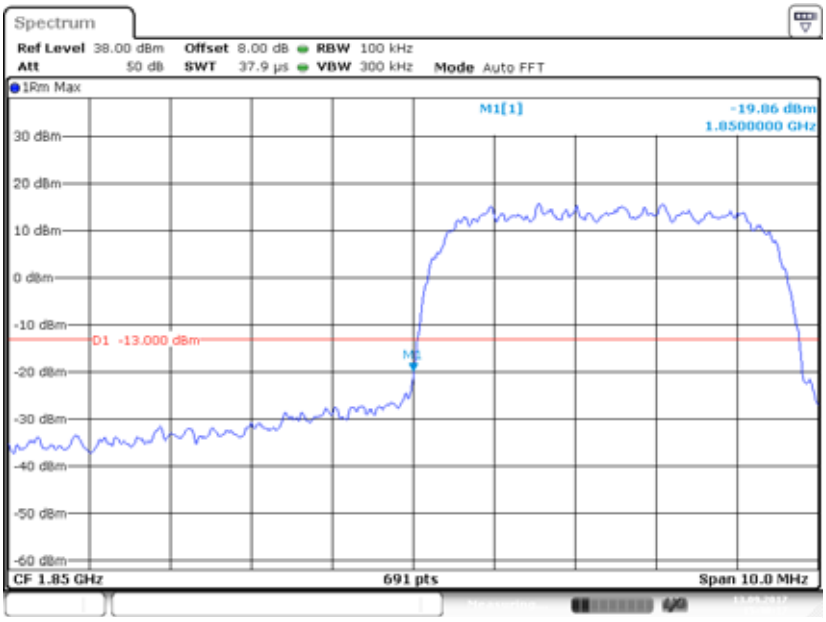
Date: 13.SEP.2017 14:50:48

PCS Band, Right Band Edge for EDGE Mode



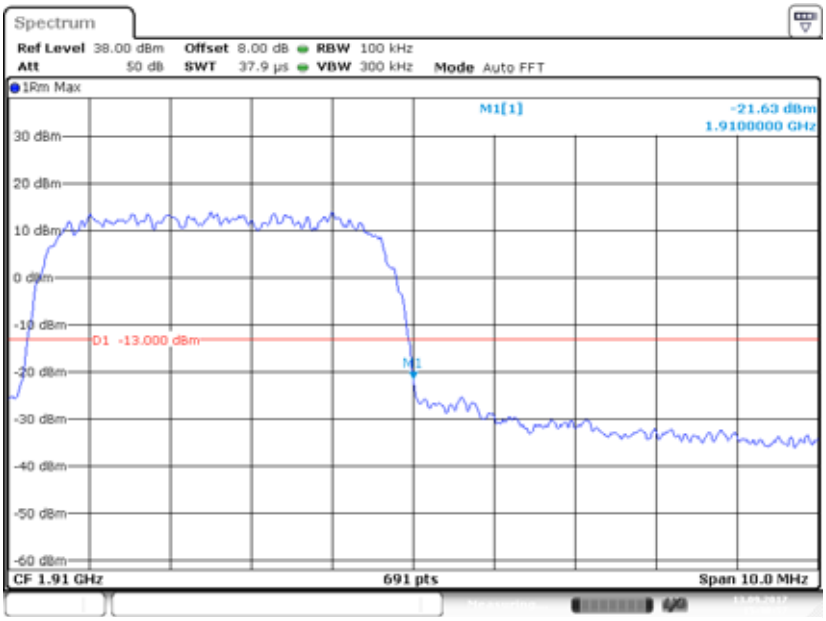
Date: 13.SEP.2017 14:51:38

PCS Band, Left Band Edge for WCDMA Band II



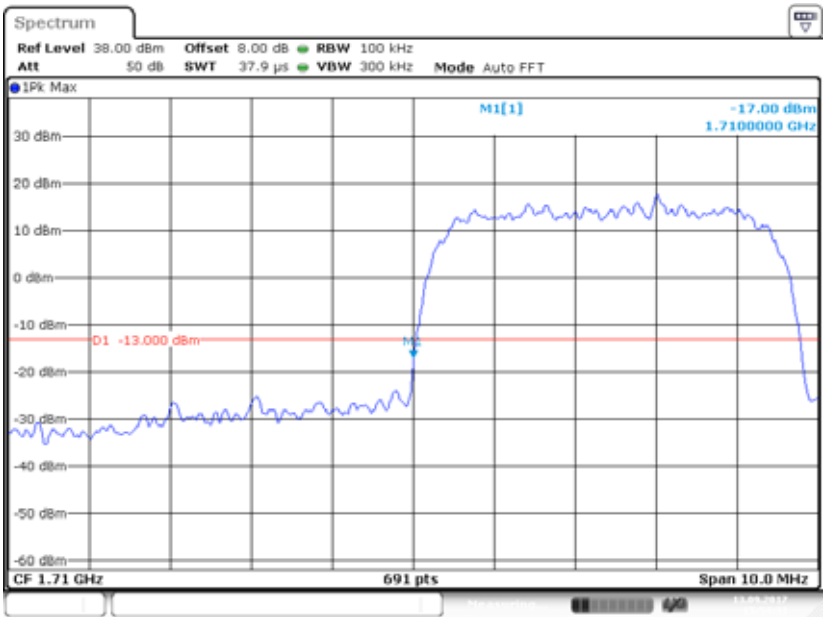
Date: 13.SEP.2017 15:30:18

PCS Band, Right Band Edge for WCDMA Band II



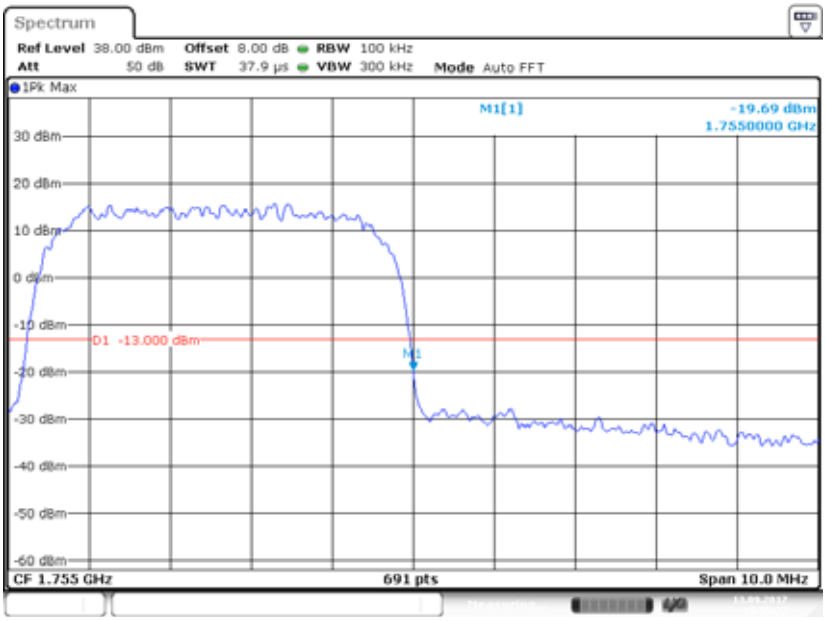
Date: 13.SEP.2017 15:30:57

PCS Band, Left Band Edge for WCDMA Band IV



Date: 13.SEP.2017 15:54:34

PCS Band, Right Band Edge for WCDMA Band IV



Date: 13.SEP.2017 15:55:22

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

Applicable Standards

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

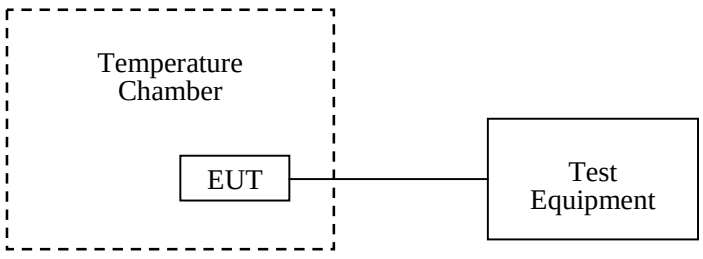
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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:	23 ℃
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

The testing was performed by Edison Hu on 2017-09-13.

EUT operation mode: Transmitting

Test Result: Compliance.

Cellular Band (Part 22H)

GPRS Mode

Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.6	5	0.00598	2.5
-20		2	0.00239	2.5
-10		6	0.00717	2.5
0		5	0.00598	2.5
10		5	0.00598	2.5
20		-3	-0.00359	2.5
30		2	0.00239	2.5
40		-2	-0.00239	2.5
50		-1	-0.00120	2.5
25	V min.= 3.3	4	0.00478	2.5
25	V max.= 4.0	4	0.00478	2.5

EDGE Mode

Middle Channel, f_o =836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.60	11	0.01315	2.5
-20		11	0.01315	2.5
-10		15	0.01793	2.5
0		12	0.01434	2.5
10		13	0.01554	2.5
20		15	0.01793	2.5
30		10	0.01195	2.5
40		12	0.01434	2.5
50		14	0.01673	2.5
25	V min.= 3.3	14	0.01673	2.5
25	V max.= 4.0	14	0.01673	2.5

WCDMA Band V

Middle Channel, fo =836.6 MHz				
Temperature (℃)	**Power Supplied (VDC)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.60	-3	-0.00359	2.5
-20		-2	-0.00239	2.5
-10		-6	-0.00717	2.5
0		-2	-0.00239	2.5
10		-4	-0.00478	2.5
20		-5	-0.00598	2.5
30		-3	-0.00359	2.5
40		-2	-0.00239	2.5
50		-3	-0.00359	2.5
25	V min.= 3.3	-6	-0.00717	2.5
25	V max.= 4.0	-6	-0.00717	2.5

PCS Band (Part 24E)

GPRS Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.60	-5	-0.00266	pass
-20		-6	-0.00319	pass
-10		-10	-0.00532	pass
0		-2	-0.00106	pass
10		2	0.00106	pass
20		-2	-0.00106	pass
30		1	0.00053	pass
40		-4	-0.00213	pass
50		-12	-0.00638	pass
25	V min.= 3.3	-6	-0.00319	pass
25	V max.= 4.0	-11	-0.00585	pass

EDGE Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.60	-6	-0.00319	pass
-20		-1	-0.00053	pass
-10		-11	-0.00585	pass
0		-2	-0.00106	pass
10		-3	-0.00160	pass
20		2	0.00106	pass
30		-3	-0.00160	pass
40		13	0.00691	pass
50		5	0.00266	pass
25	V min.= 3.3	5	0.00266	pass
25	V max.= 4.0	2	0.00106	pass

WCDMA Band II

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (VDC)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.60	-5	-0.00266	pass
-20		-6	-0.00319	pass
-10		-3	-0.00160	pass
0		-11	-0.00585	pass
10		-10	-0.00532	pass
20		-2	-0.00106	pass
30		-4	-0.00213	pass
40		-7	-0.00372	pass
50		-5	-0.00266	pass
25	V min.= 3.3	-6	-0.00319	pass
25	V max.= 4.0	-7	-0.00372	pass

AWS Band (Part 27)

WCDMA Band IV

Middle Channel, f_o =1732.6 MHz				
Temperature (℃)	**Power Supplied (VDC)**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.60	-6	-0.00346	pass
-20		-8	-0.00462	pass
-10		-4	-0.00231	pass
0		-11	-0.00635	pass
10		-9	-0.00519	pass
20		-3	-0.00173	pass
30		-2	-0.00115	pass
40		-5	-0.00289	pass
50		-3	-0.00173	pass
25	V min.= 3.3	-4	-0.00231	pass
25	V max.= 4.0	-5	-0.00289	pass

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