FCC PART 22H, PART 24E

MEASUREMENT AND TEST REPORT

For

MOBIWIRE MOBILES (NINGBO) CO., LTD

No.999, Dacheng East Road, Fenghua, Zhejiang, China

FCC ID: 2ADA4S241

Report Type:	**Product Type:**
Original Report	2G Feature Phone

Test Engineer:	Aaron Wang
Report Number:	RSHA180110002-00C
Report Date:	2018-01-29
Reviewed By:	Oscar Ye RF Leader
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

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	MOBIWIRE MOBILES (NINGBO) CO., LTD
Tested Model	S241
Product Type	2G Feature Phone
Dimension	121.4mm(L)*50.0mm(W)*13.3mm(H)
Power Supply	DC 3.7V by battery

**All measurement and test data in this report was gathered from production sample serial number: 20180110002. (Assigned by the BACL. The EUT supplied by the applicant was received on 2018-01-10)*

Objective

This type approval report is prepared on behalf of MOBIWIRE MOBILES (NINGBO) CO., LTD in accordance with Part 2, Part 22-Subpart H, Part 24-Subpart E 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 Part 15.247 DSS submission with FCC ID: 2ADA4S241.

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.

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
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
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 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.

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.

Channel List

Mode	Channel		Frequency
GSM 850	Low	128	824.2
	Middle	190	836.6
	High	251	848.8
PCS 1900	Low	512	1850.2
	Middle	661	1880.0
	High	810	1909.8

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

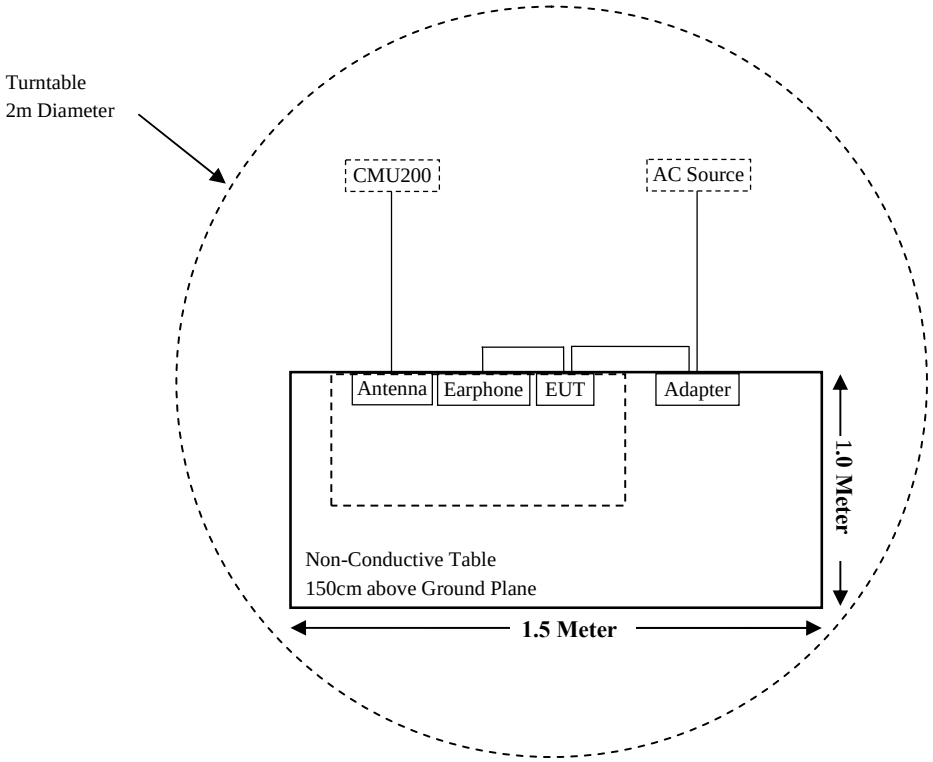
Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605
MOBIWIRE	Earphone	/	/
TE CONNECTIVITY	Antenna	/	/
TENPAO	Adapter Input: AC100-240V,50/60Hz,150mA Output: DC5V, 1000mA	S005UA0500100	178111868

External Cable List and Details

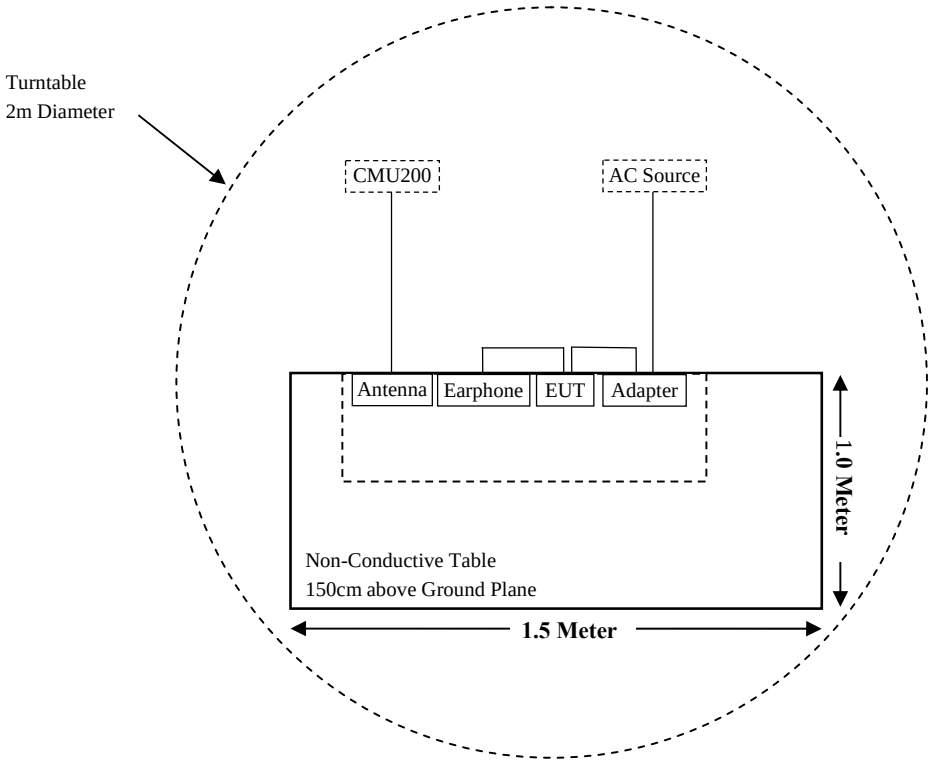
Cable Description	Shielding Type	Length (m)	From Port	To
USB Cable	Un-shielding	0.8	EUT	Adapter

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz)



For Radiated Emissions(Above 1GHz)



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307(b)(1)& §2.1093	RF Exposure Information	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)	Spurious Radiated Emissions	Compliance
§ 22.917 (a); § 24.238 (a)	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235	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	2017-11-12	2018-11-11
HP	Signal Generator	HP 8341B	2624A00116	2017-08-29	2018-08-28
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
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-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	2017-11-12	2018-11-11
Radiated Emission Test（Chamber 2#）					
HP	Signal Generator	HP 8341B	2624A00116	2017-08-29	2018-08-28
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2017-08-27	2018-08-26
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	2016-10-18	2019-10-17
ETS-LINDGREN	Horn Antenna	3116	2516	2016-12-12	2019-12-12
Narda	Pre-amplifier	AFS42-00101800	2001270	2017-12-12	2018-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2017-12-12	2018-12-11
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
MICRO-COAX	Coaxial Cable	Cable-16	016	2017-08-15	2018-08-14
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2017-11-12	2018-11-11

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2017-09-21	2018-09-20
Rohde & Schwarz	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	110605	2017-11-12	2018-11-11
BACL	Temperature & Humidity Chamber	BTH-150	30023	2017-10-10	2018-10-09
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2017-10-10	2018-10-09
MOBIWIRE	RF Cable	/	/	/	/

*** 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) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1307,§2.1093.

Test Result

Compliance, please refer to the SAR report: RSH180110051-20M1.

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.

§2.1046; § 22.913 (a);§ 24.232 (c) – RF OUTPUT POWER

Applicable Standards

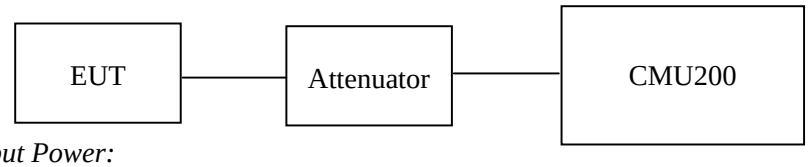
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts(38.45dBm).

According to FCC §2.1046 and §24.232 (c), mobile and portable stations are limited to 2 watts(33dBm) EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

Test Procedure

Conducted method:

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



Radiated Output Power:
The measurements procedures specified in ANSI/TIA-603-D were applied.
a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
b) Key the transmitter, then rotate the EUT 360o azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used,raise and lower the test antenna to obtain a maximum reading.
LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)
e) Determine the effective radiated output power at each angular position from
the readings in steps b) and d) using the following equation:
ERP (dBm) = LVL (dBm) + LOSS (dB)
f) The maximum ERP is the maximum value determined in the preceding step.
(Note: Effective Isotropic Radiated Power (EIRP) can be computed using the following:
EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

Test Data

Environmental Conditions

Temperature:	23.4 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Aaron Wang on 2018-01-23.

Conducted Power:

GSM 850 Band

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	32.82	38.45
	190	836.6	32.91	38.45
	251	848.8	33.13	38.45

PCS 1900 Band

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	30.13	33
	661	1880.0	30.14	33
	810	1909.8	30.01	33

Peak-to-average ratio (PAR):

PCS 1900 Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	2.27	13
	Middle	2.23	13
	High	2.31	13

Radiated Power:

GSM 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 (dBd/dBi)			
GSM850 Band, Middle Channel (ERP)										
836.60	95.12	57	147	H	31.43	0.63	-1.14	29.66	38.45	8.79
836.60	99.76	245	159	V	32.61	0.63	-1.14	30.84	38.45	7.61
PCS 1900 Band, Middle Channel (EIRP)										
1880.00	89.76	228	208	H	18.72	0.85	8.81	26.68	33.00	6.32
1880.00	87.79	134	162	V	16.44	0.85	8.81	24.40	33.00	8.60

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 – OCCUPIED BANDWIDTH

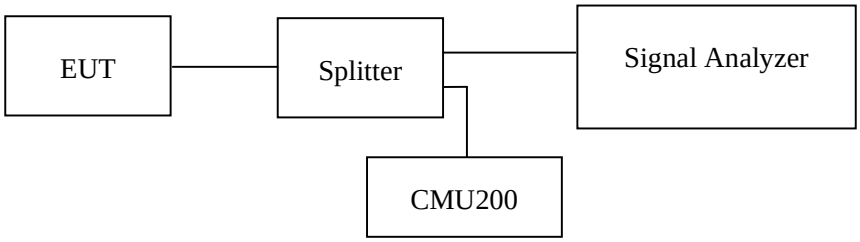
Applicable Standards

FCC 47 §2.1049, §22.917, §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 resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	23.4 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Aaron Wang on 2018-01-23.

EUT operation mode: Transmitting

Test Result: Compliant.

GSM 850 Band

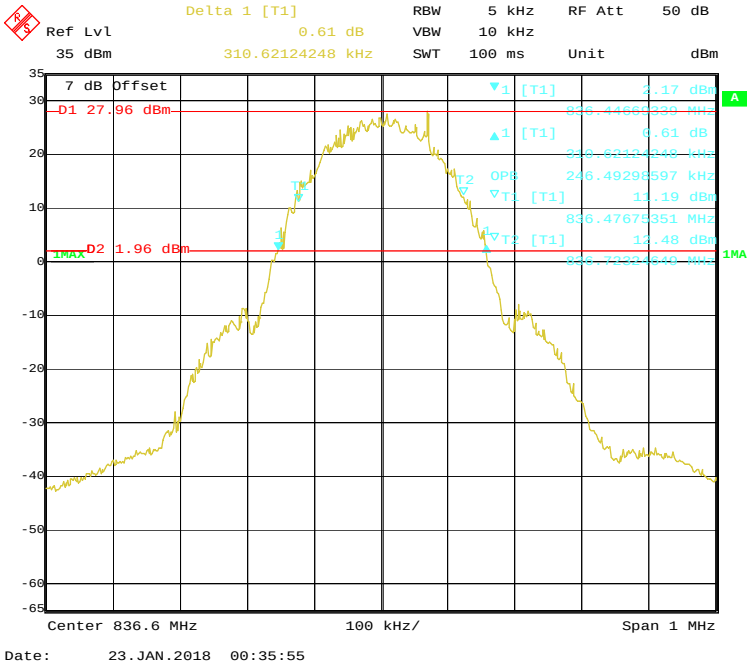
Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GSM(GMSK)	836.6	0.311	0.246

PCS 1900Band

Mode	Frequency (MHz)	26 dB Emission Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
GSM(GMSK)	1880.0	0.317	0.246

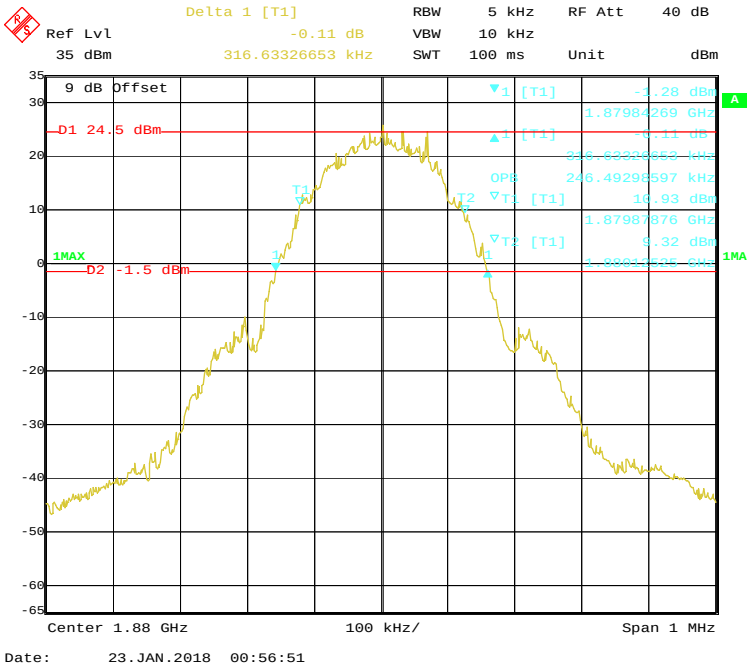
GSM 850 Band

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



PCS 1900Band

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



§ 2.1051; § 22.917 (a);§ 24.238 (a) – SPURIOUS EMISSIONS AT ANTENNA TERMINALS

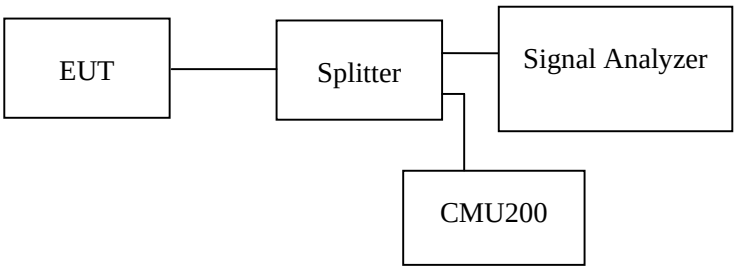
Applicable Standards

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. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.



Test Data

Environmental Conditions

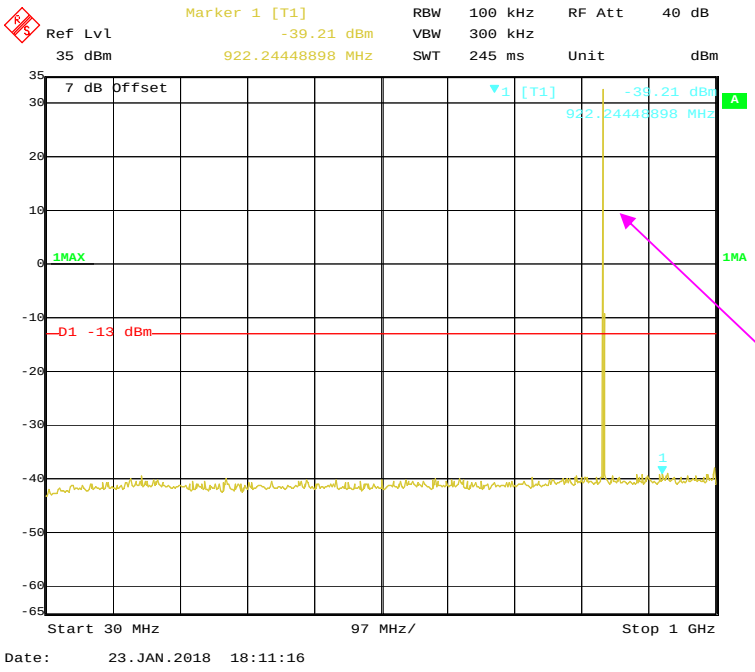
Temperature:	23.4 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Aaron Wang on 2018-01-23.

EUT operation mode: Transmitting

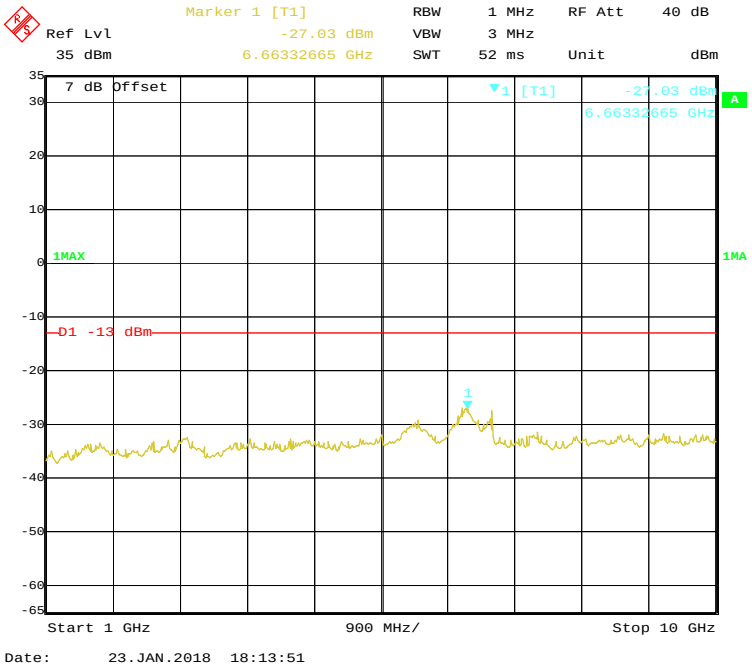
GSM 850 Band:

30 MHz – 1 GHz (GSM Mode)



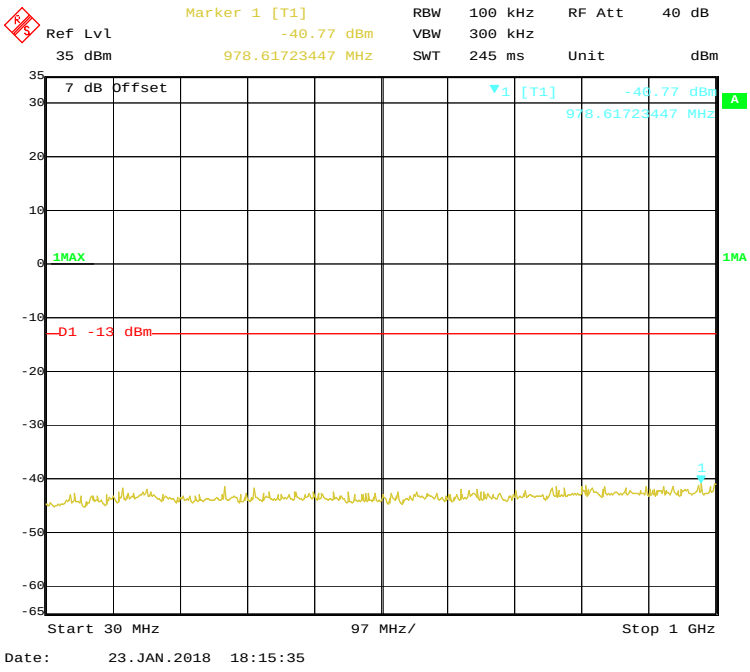
Fundamental

1 GHz – 10 GHz (GSM Mode)

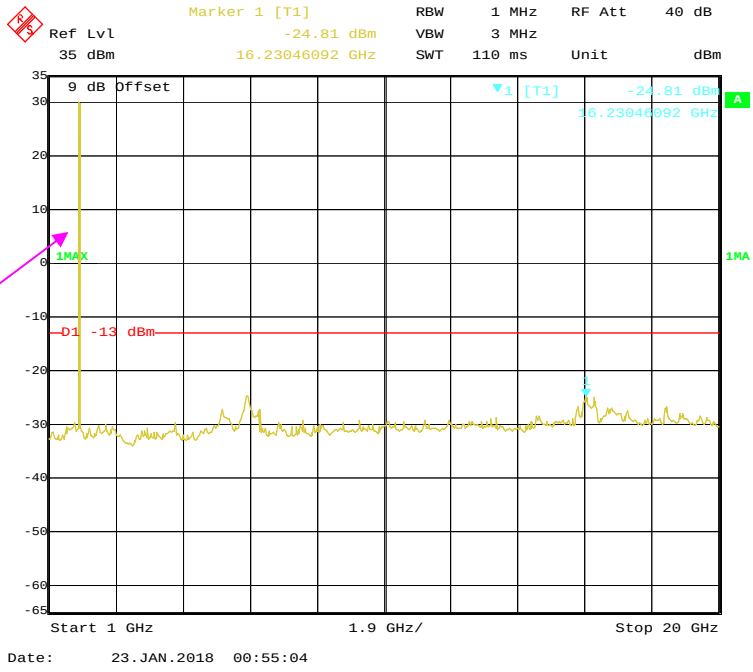


PCS 1900 Band:

30 MHz – 1 GHz (GSM Mode)



1 GHz – 20 GHz (GSM Mode)



Fundamental

FCC § 2.1053; § 22.917 (a);§ 24.238 (a) – SPURIOUS RADIATED EMISSIONS

Applicable Standards

FCC § 2.1053, §22.917(a) and § 24.238(a)

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.

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:	23.2 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Aaron Wang on 2018-01-24.

Test mode: Transmitting (Pre-scan with low, middle, high channel, and the worse case data as below)

30 MHz ~ 10 GHz:

GSM 850 Band

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)			
GSM Mode, Middle Channel										
260.56	44.89	43	152	H	-57.75	0.44	-2.23	-60.42	-13.00	47.42
260.56	45.81	89	218	V	-63.11	0.44	-2.23	-65.78	-13.00	52.78
1673.20	53.87	33	152	H	-57.08	0.84	8.48	-49.44	-13.00	36.44
1673.20	57.22	289	227	V	-53.98	0.84	8.48	-46.34	-13.00	33.34
2509.80	51.42	80	234	H	-59.72	0.89	10.09	-50.52	-13.00	37.52
2509.80	48.49	9	127	V	-62.72	0.89	10.09	-53.52	-13.00	40.52

30 MHz ~ 20 GHz:

PCS 1900 Band

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)			
GSM Mode, Middle Channel										
88.69	46.85	32	212	H	-60.31	0.31	-7.07	-67.69	-13.00	54.69
88.69	47.29	262	215	V	-56.14	0.31	-7.07	-63.52	-13.00	50.52
3760.00	47.22	322	161	H	-56.47	0.95	9.74	-47.68	-13.00	34.68
3760.00	45.68	192	180	V	-58.33	0.95	9.74	-49.54	-13.00	36.54
5640.00	48.69	202	226	H	-51.82	1.15	10.47	-42.50	-13.00	29.50
5640.00	49.87	233	209	V	-50.94	1.15	10.47	-41.62	-13.00	28.62

Note:
Absolute Level = Submitted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

FCC § 22.917 (a);§ 24.238 (a) – BAND EDGES

Applicable Standards

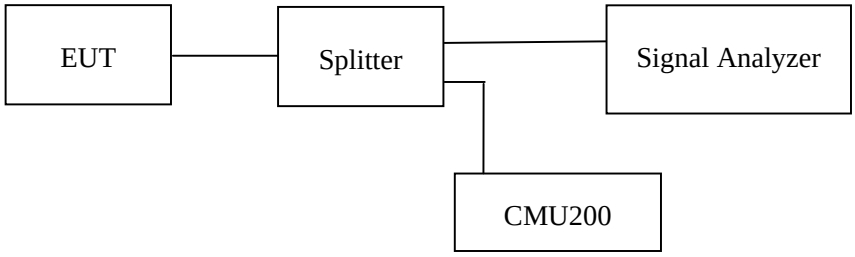
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

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.

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:	23.4 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

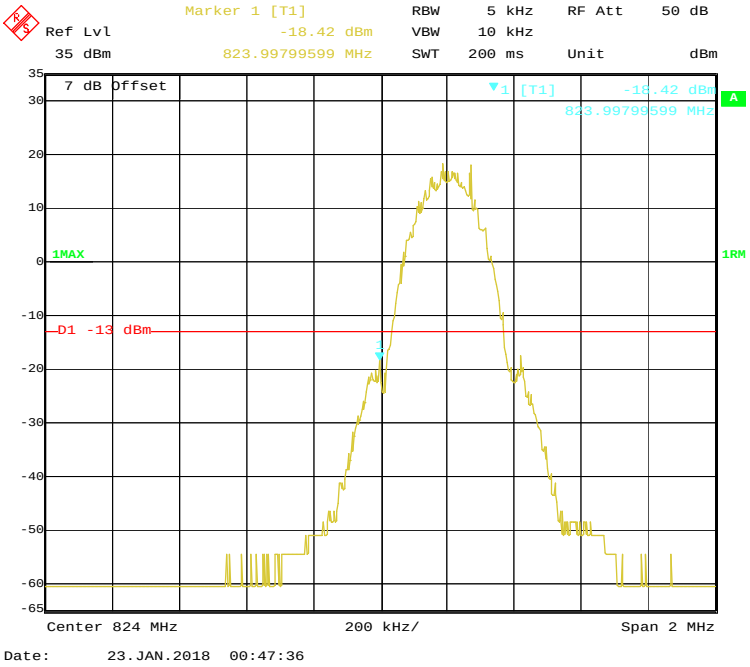
The testing was performed by Aaron Wang on 2018-01-23.

EUT operation mode: Transmitting

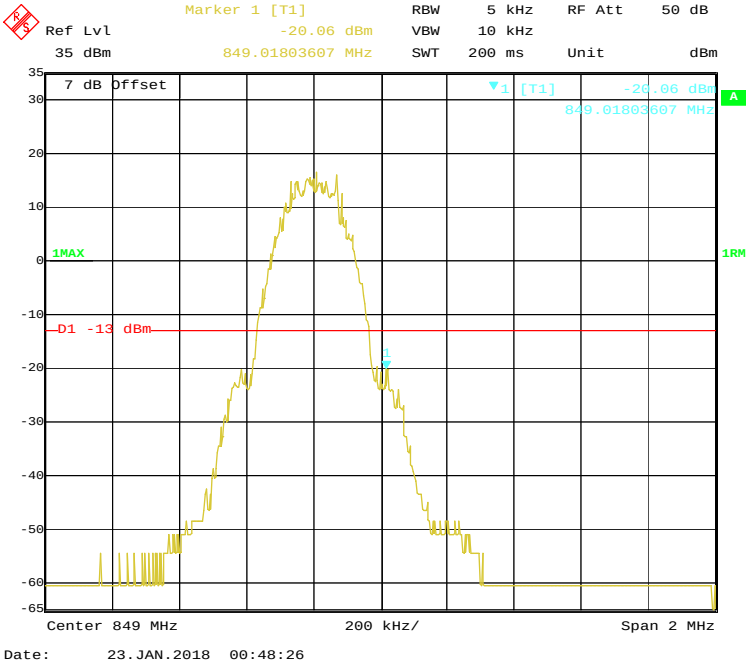
Test Result: Compliant

GSM 850 Band:

GSM Mode, Left Band Edge

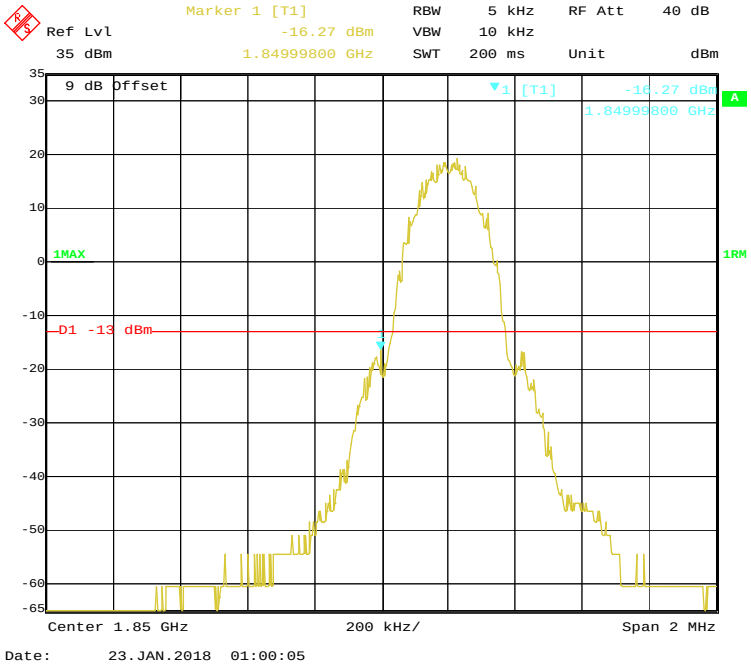


GSM Mode, Right Band Edge

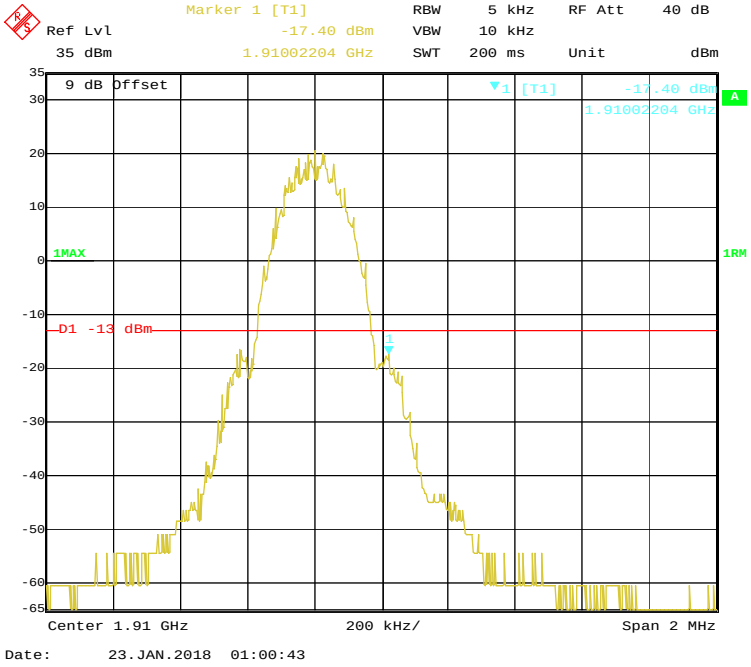


PCS 1900 Band:

GSM Mode, Left Band Edge



GSM Mode, Right Band Edge



FCC § 2.1055; § 22.355;§ 24.235 – FREQUENCY STABILITY

Applicable Standards

FCC § 2.1055, §22.355, §24.235.

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

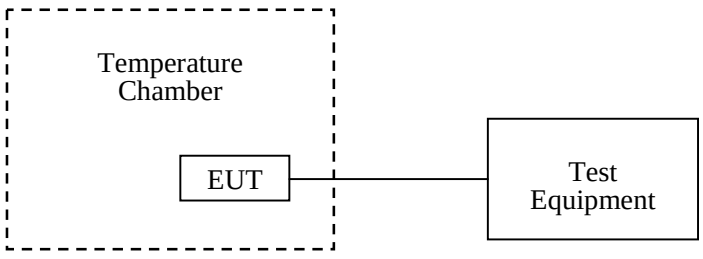
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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:	23.4 ℃
Relative Humidity:	50 %
ATM Pressure:	101.2 kPa

The testing was performed by Aaron Wang on 2018-01-23.

EUT operation mode: Transmitting

Test Result: Compliance.

GSM 850 Band:

GSM Mode, Middle Channel, f_o=836.6 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.7	9	0.01076	2.5
-20		12	0.01434	2.5
-10		9	0.01076	2.5
0		13	0.01554	2.5
10		10	0.01195	2.5
20		8	0.00956	2.5
30		6	0.00717	2.5
40		10	0.01195	2.5
50		15	0.01793	2.5
25	V min.= 3.6	6	0.00717	2.5
25	V max.= 4.2	8	0.00956	2.5

PCS 1900 Band:

GSM Mode, Middle Channel, f_0 =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.7	-9	-0.00479	pass
-20		-15	-0.00798	pass
-10		-8	-0.00426	pass
0		-7	-0.00372	pass
10		-11	-0.00585	pass
20		-1	-0.00053	pass
30		-13	-0.00691	pass
40		-2	-0.00106	pass
50		-8	-0.00426	pass
25	V min.= 3.6	-12	-0.00638	pass
25	V max.= 4.2	-11	-0.00585	pass

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