

FCC PART 22H, PART 24E

TEST REPORT

For

Quectel Wireless Solutions Company Limited

Room501, Building13, No.99TianZhouRoad, Xuhui District, Shanghai, China

Model: M26

FCC ID: XMR201604M26

Report Type Original Report	Product Type: LCC GSM/GPRS Module
Test Engineer : <u>David. Hsu</u> <i>David. Hsu</i>	
Report Number : <u>RTW160524001-00</u>	
Report Date : <u>2016-05-11</u>	
Reviewed By: <u>Jerry.Chang</u> <i>Jerry.Chang</i>	
Prepared By: Bay Area Compliance Laboratories Corp.(Taiwan) 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C. Tel: +886 (2)2647 6898 Fax: +886 (2) 2647 6895 www.bacl.com.tw	

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.(Taiwan)

Revision History

Revision	Issue Date	Description
1.0	2016.05.11	Original Report

TABLE OF CONTENTS

GENERAL INFORMATION	5
Product Description for Equipment under Test (EUT)	5
Objective	5
Related Submittal(s)/Grant(s).....	5
Test Methodology	6
SYSTEM TEST CONFIGURATION	7
Description of Test Configuration.....	7
Equipment Modifications	7
Specific accessory equipment	7
External I/O Cable.....	7
External Cable List and Details.....	7
Block Diagram of Test Setup	8
SUMMARY OF TEST RESULTS.....	9
FCC §1.1307& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)	10
Applicable Standard	10
Test Result.....	11
FCC §2.1047 - MODULATION CHARACTERISTIC	12
FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER	13
Applicable Standard	13
Test Procedure.....	13
Test Equipment List and Details	13
Test Data	14
FCC §2.1049, §22.917, §22.905 & §24.238 - BANDWIDTH	17
Applicable Standard	17
Test Procedure.....	17
Test Equipment List and Details	17
Test Data	18
FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA	
TERMINALS.....	20
Applicable Standard	20
Test Procedure.....	20
Test Equipment List and Details	20
Test Data	21
FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS.....	24
Applicable Standard	24
Test Procedure.....	24
Test Equipment List and Details	24
Test Data	25
FCC§22.917(a) & §24.238(a) - BAND EDGES.....	27
Applicable Standard	27
Test Procedure.....	27

Test Equipment List and Details	27
Test Data	28
FCC§2.1055, §22.355 & §24.235 - FREQUENCY STABILITY	31
Applicable Standard	31
Test Procedure.....	31
Test Equipment List and Details	32
Test Data	32

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Quectel Wireless Solutions Company Limited Room501,Building13,No.99TianZhouRoad,Xuhui District,Shanghai, China
Product	LCC GSM/GPRS Module
Model	M26
Model Discrepancy	N/A
Trade Name	N/A
Voltage Range	DC 3.3V~4.6V
Frequency Range	GSM 850 : 824.2 ~ 848.8 MHz(TX), 869.2 ~ 893.8 MHz(RX) PCS 1900: 1850.2 ~ 1909.8 MHz(TX), 1930 ~ 1990 MHz(RX)
Transmit Power (ERP & EIRP Power)	GSM 850: 32.15dBm PCS 1900: 29.56 dBm
Modulation type	GMSK
Type of Emission	GSM 850: 246KGXW--- PCS1900: 245KGXW---
Antenna Gain	GSM 850: 1.0dBi PCS1900: 1.0dBi
Antenna Type	Linear polarization Antenna
Date of Test:	APR. 27,2016~MAY.10, 2016

**All measurement and test data in this report was gathered from production sample serial number: 20160419001
(Assigned by BACL, Taiwan). The EUT supplied by the applicant was received on 2016-04-19.*

Objective

This test report is prepared on behalf of Quectel Wireless Solutions Company Limited 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)

FCC Part 15.247 DSS submissions with FCC ID: XMR201604M26.

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

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

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

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 tested.

Specific accessory equipment

Description	parameter	Serial Number
GSM antenna	PCB Antenna, antenna Gain: GSM850: 1dBi, DCS1900: 1dBi	N/A

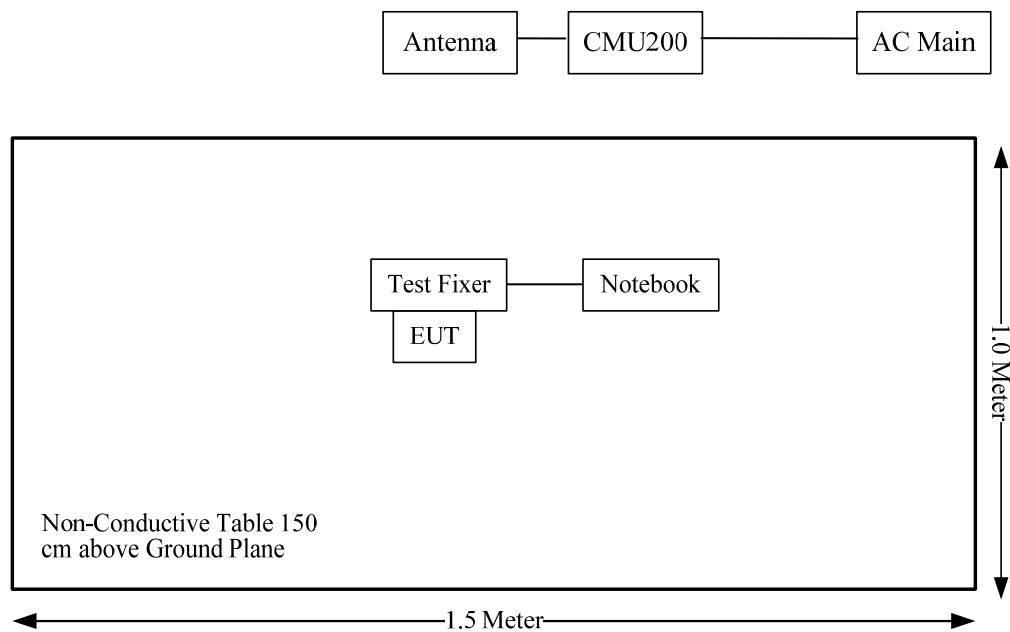
External I/O Cable

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	106891
Dell	Notebook	E6410	N/A
Quectel	Test Fixer	N/A	N/A

External Cable List and Details

Cable Description	Length (m)	From Port	To
USB CABLE	1.0	EUT	Notebook

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307, §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	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	Bandwidth	Compliance
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	Compliance
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

FCC §1.1307& §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1051 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

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:

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

Test Result

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	S _i /S _{limit}
		(dBi)	(numeric)	(dBm)	(mW)				
GSM850	824.2-848.8	1.0	1.26	33	1995.26	20.00	0.5000	0.55	0.9091
DCS1900	1850.2-1909.8	1.0	1.26	30	1000.00	20.00	0.2506	1.0	0.2506
Bluetooth	2402-2480	1.06	1.28	10	10.00	20.00	0.0025	1.0	0.0025

Note: Target Power =the max power including Tune-up tolerance, the tune up power declared by manufacture as:

GSM850= 32±1dBm; GSM1900=29±1dBm; BT=8.0±2dBm

GSM850 or PCS1900 can transmit simultaneously with Bluetooth, Maximum S_i/S_{limit} is GSM 850 mode,

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

$$=S_{850}/S_{limit_850} + S_{BT}/S_{limit_BT}$$

$$=0.9091 + 0.0025$$

$$=0.9116$$

$$< 1.0$$

Result: The device meet FCC MPE at 20 cm distance

FCC §2.1047 - MODULATION CHARACTERISTIC

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

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

Applicable Standard

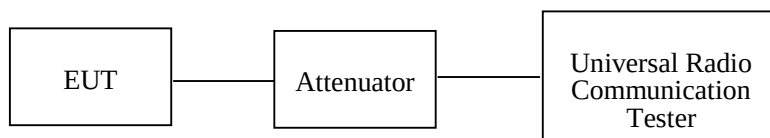
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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

Test Procedure

Conducted method:

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



Radiated method:

TIA 603-D section 2.2.17

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI	100540	2015-07-25	2016-07-24
Sunol Sciences	Broadband Antenna	JB6	A050115	2015-06-15	2016-06-14
EMCO	Horn Antenna	3115	9311-4158	2015-05-08	2016-05-07
ETS	Horn Antenna	3115	6431	2015-11-07	2016-11-06
Rohde & Schwarz	Spectrum Analyzer	FSU 26	200268	2015-07-29	2016-08-28
EMCO	Turn Table	2081-1.21	9709-1885	N.C.R	N.C.R
EMCO	Antenna Tower	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
R&S	Software	EMC32	V9.10.00	NCR	NCR
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-12-16	2016-12-15
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David. Hsu on 2016-05-06.

Conducted Power**Cellular Band (Part 22H)**

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	32.15	38.45
	190	836.6	32.08	38.45
	251	848.8	31.96	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	32.18	31.59	29.59	28.15	38.45
	190	836.6	32.06	31.12	29.26	27.88	38.45
	251	848.8	31.89	30.79	28.86	27.42	38.45

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	29.56	33
	661	1880.0	29.45	33
	810	1909.8	29.12	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	29.46	28.05	26.13	25.04	33
	661	1880.0	29.14	27.75	25.97	24.68	33
	810	1909.8	28.67	27.16	25.68	24.34	33

Peak-to-average ratio (PAR)**Cellular Band**

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.21	13
	Middle	0.36	13
	High	0.41	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.29	13
	Middle	0.32	13
	High	0.36	13

Radiated Power**GSM Mode:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	S.G. Level (dBm)	Cable loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
ERP for Cellular Band (Part 22H), Middle Channel										
836.6	127.60	220	1.8	H	30.52	0.3	0.0	30.22	38.45	8.23
836.6	131.12	185	1.5	V	34.04	0.3	0.0	33.74	38.45	4.71
EIRP for PCS Band (Part 24E), Middle Channel										
1880.00	124.75	100	1.6	H	23.62	1.40	7.30	29.52	33	3.48
1880.00	123.59	33	2.5	V	22.46	1.40	7.30	28.36	33	4.64

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 - BANDWIDTH

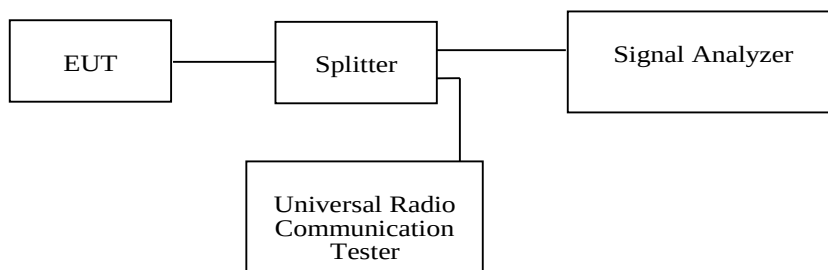
Applicable Standard

FCC §2.1049, §22.917, §22.905 and §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 (GSM) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	SIGNAL ANALYZER	FSV40	101116	2015-09-02	2016-09-02
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	828590	2015-11-12	2016-11-11
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David. Hsu on 2016-04-27.

EUT operation mode: Transmitting

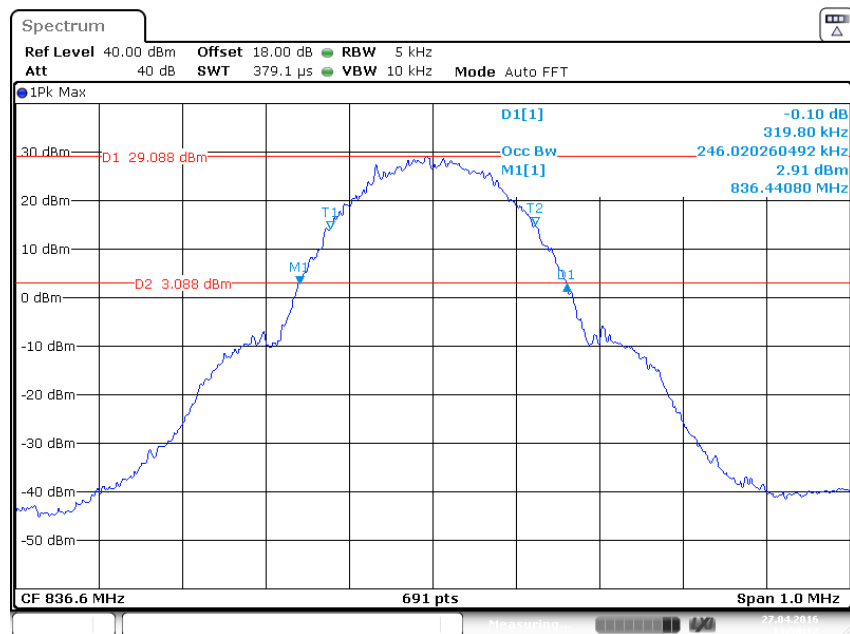
Test Result: Compliance. Please refer to the following tables and plots.

Cellular Band (Part 22H)

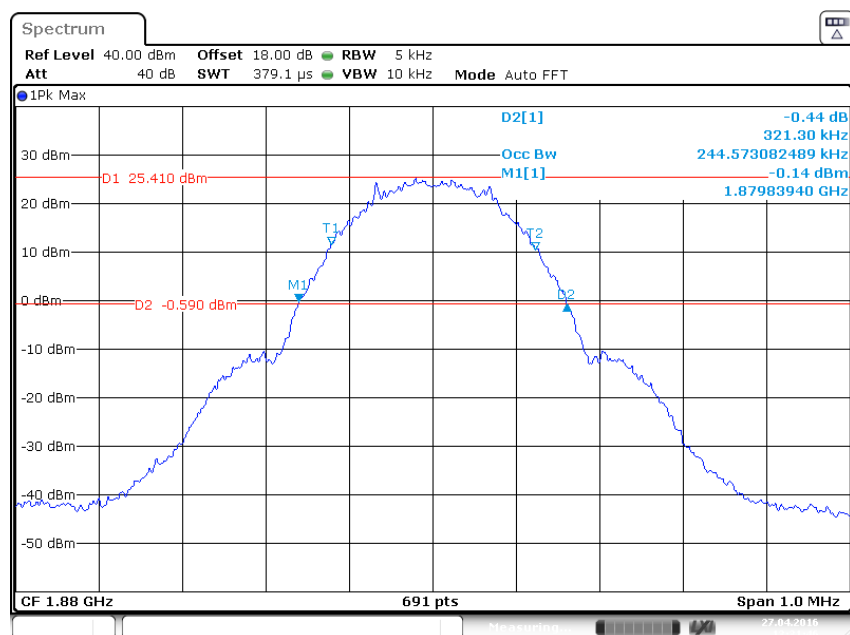
Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	836.6	246.0	319.8

PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	1880.0	244.6	321.3

Cellular Band (Part 22H)**99% Occupied Bandwidth & 26 dB Emissions Bandwidth for GSM (GMSK) Mode**

Date: 27 APR 2016 13:50:12

PCS Band (Part 24E)**99% Occupied Bandwidth & 26 dB Emissions Bandwidth for GSM (GMSK) Mode**

Date: 27 APR 2016 13:31:46

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

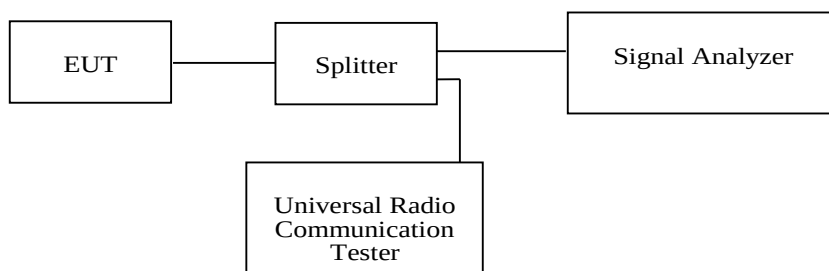
Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



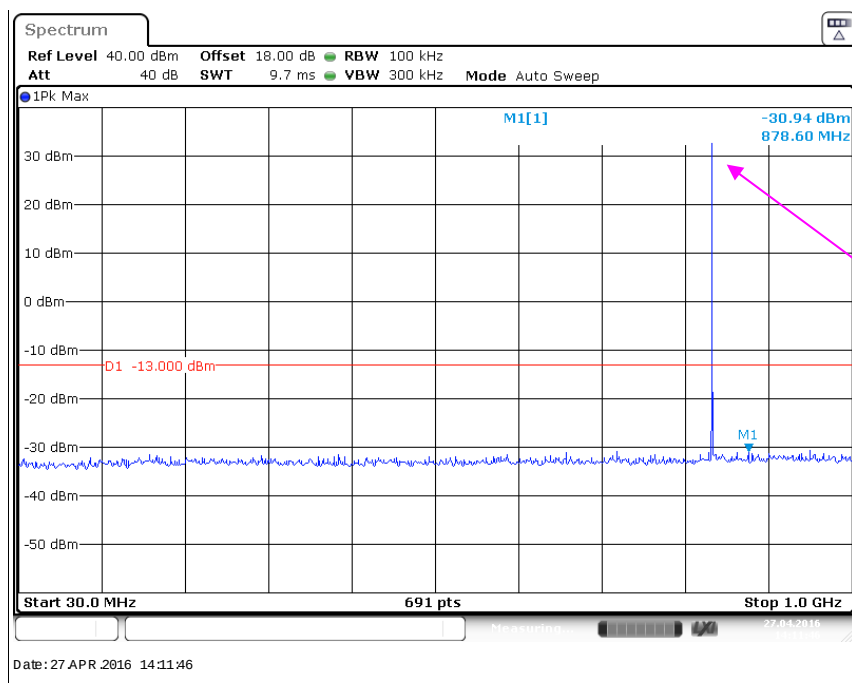
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	SIGNAL ANALYZER	FSV40	101116	2015-09-02	2016-09-02
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	828590	2015-11-12	2016-11-11
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

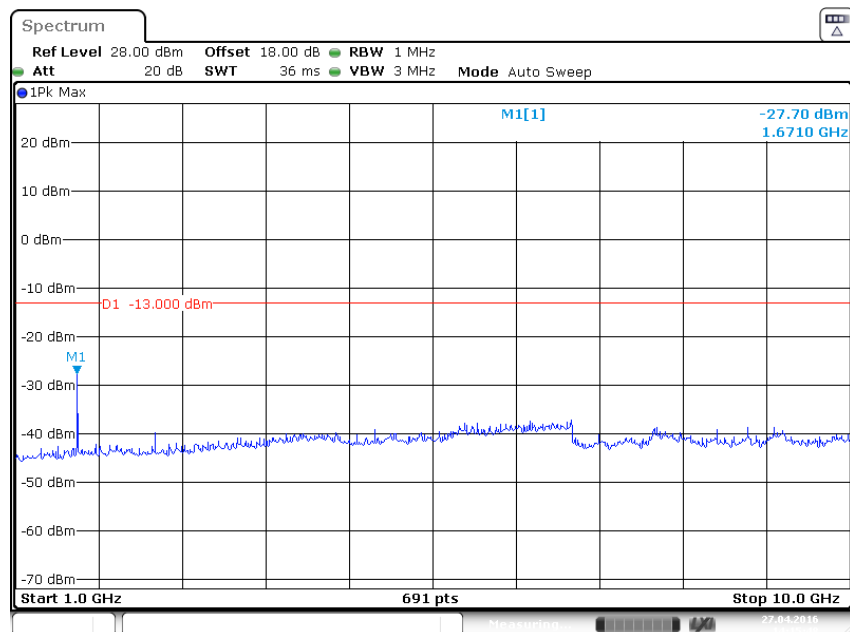
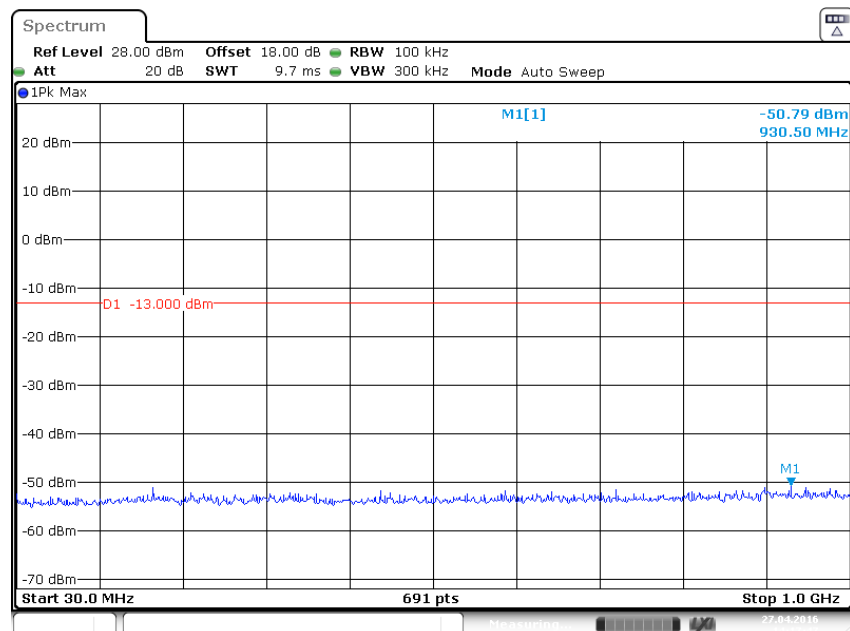
Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

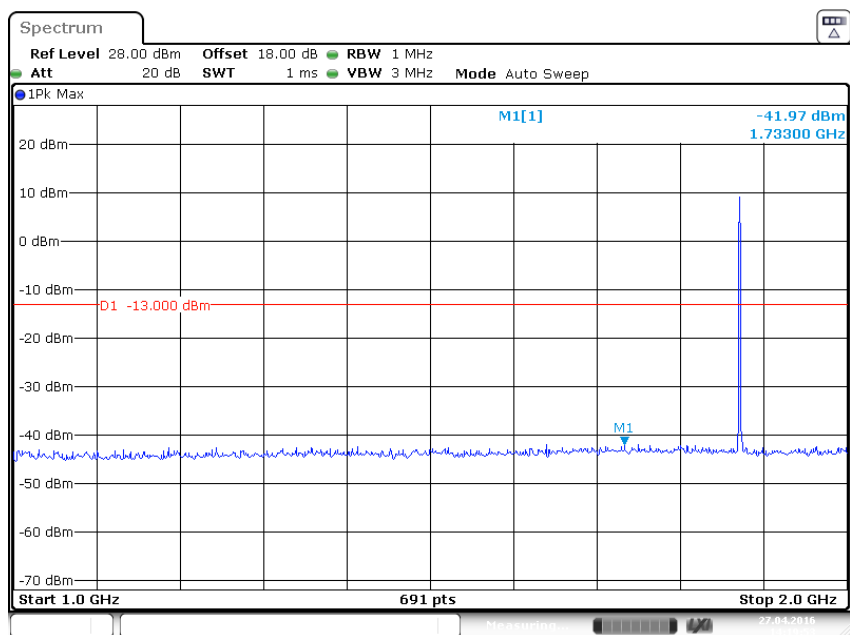
The testing was performed by David. Hsu on 2016-04-27.

Cellular Band (Part 22H)**30 MHz – 1 GHz**

Fundamental

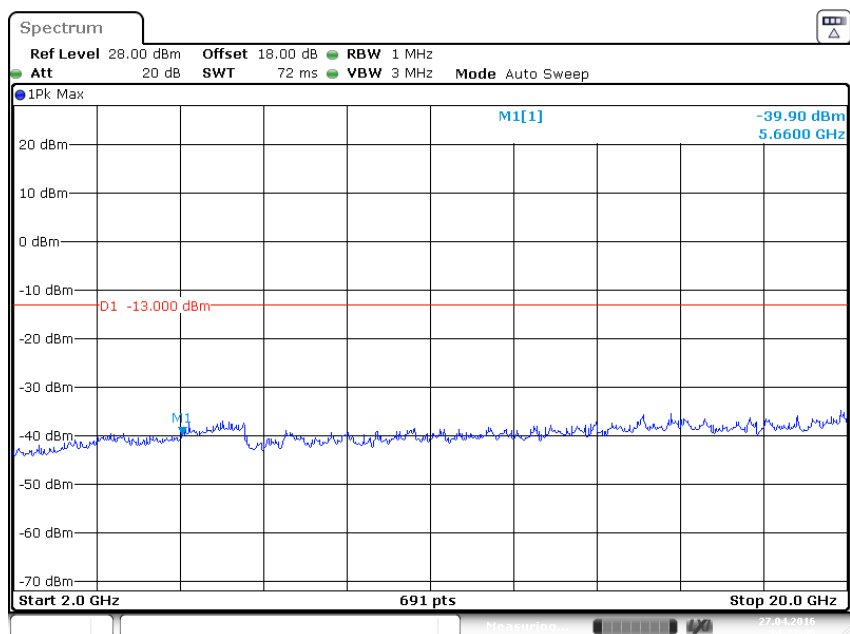
1 GHz – 10 GHz (GSM Mode)**PCS Band (Part 24E)****30 MHz – 1 GHz (GSM Mode)**

1 GHz – 2 GHz (GSM Mode)



Date: 27 APR 2016 14:15:53

2 GHz – 20 GHz (GSM Mode)



Date: 27 APR 2016 14:22:46

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

FCC §2.1051, §22.917 and §24.238.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the 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 (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Sonoma	Amplifier	310N	130601	2015-07-02	2016-07-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100540	2015-07-25	2016-07-24
Sunol Sciences	Broadband Antenna	JB6	A050115	2015-06-15	2016-06-14
Mini	Amplifier	ZVA-213-S+	460901516	2015-08-21	2016-08-21
EMCO	Horn Antenna	3115	9311-4158	2015-05-08	2016-05-07
ETS	Horn Antenna	3115	6431	2015-11-07	2016-11-06
Rohde & Schwarz	Spectrum Analyzer	FSU 26	200268	2015-07-29	2016-08-28
EMCO	Turn Table	2081-1.21	9709-1885	N.C.R	N.C.R
EMCO	Antenna Tower	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
R&S	Software	EMC32	V9.10.00	NCR	NCR
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-12-16	2016-12-15

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David. Hsu on 2016-05-04.

EUT operation mode: Transmitting

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
GSM Mode										
175.23	38.86	155	1.5	H	-58.24	0.28	0	-58.52	-13	45.52
175.23	38.52	200	1.2	V	-58.58	0.28	0	-58.86	-13	45.86
1673.20	57.70	60	2.2	H	-42.83	1.60	6.90	-37.53	-13	24.53
1673.20	63.71	0	1.4	V	-36.82	1.60	6.90	-31.52	-13	18.52

30 MHz ~ 20 GHz:

PCS Band (Part 24E)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 22H/24E	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
GSM Mode										
175.23	36.35	25	2.5	H	-60.75	0.28	0	-61.03	-13	48.03
175.23	38.63	65	2.2	V	-58.47	0.28	0	-58.75	-13	45.75
3760.00	53.35	280	1.2	H	-49.88	1.90	9.90	-41.88	-13	28.88
3760.00	59.00	101	1.2	V	-44.23	1.90	9.90	-36.23	-13	23.23
5640.00	59.78	300	2.4	H	-43.65	2.10	10.30	-35.45	-13	22.45
5640.00	61.21	100	1.2	V	-42.22	2.10	10.30	-34.02	-13	21.02
7520.00	71.48	55	2.0	H	-31.85	2.60	10.70	-23.75	-13	10.75
7520.00	70.11	155	2.3	V	-33.22	2.60	10.70	-25.12	-13	12.12
9400.00	63.79	285	1.8	H	-40.24	2.70	11.50	-31.44	-13	18.44
9400.00	59.85	321	2.5	V	-44.18	2.70	11.50	-35.38	-13	22.38

Note:

1) Absolute Level = SG Level - Cable loss + Antenna Gain

2) Margin = Limit- Absolute Level

FCC§22.917(a) & §24.238(a) - BAND EDGES

Applicable Standard

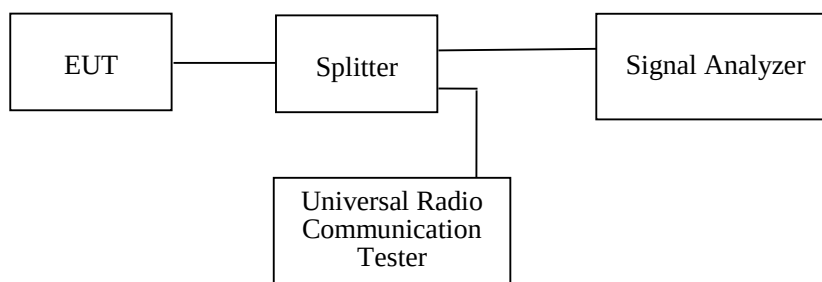
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Test Procedure

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

The center of the spectrum analyzer was set to block edge frequency



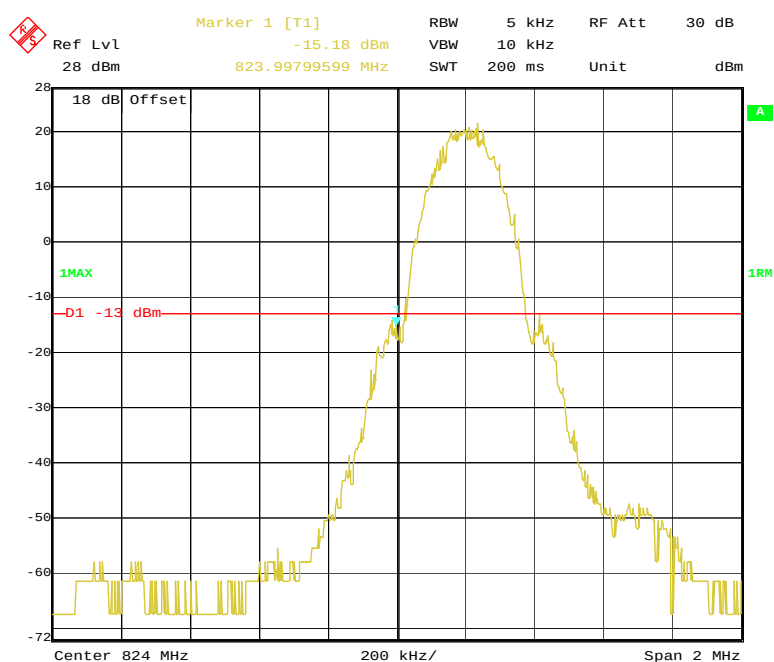
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
Rohde & Schwarz	SIGNAL ANALYZER	FSV40	101116	2015-09-02	2016-09-02
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	828590	2015-11-12	2016-11-11
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10

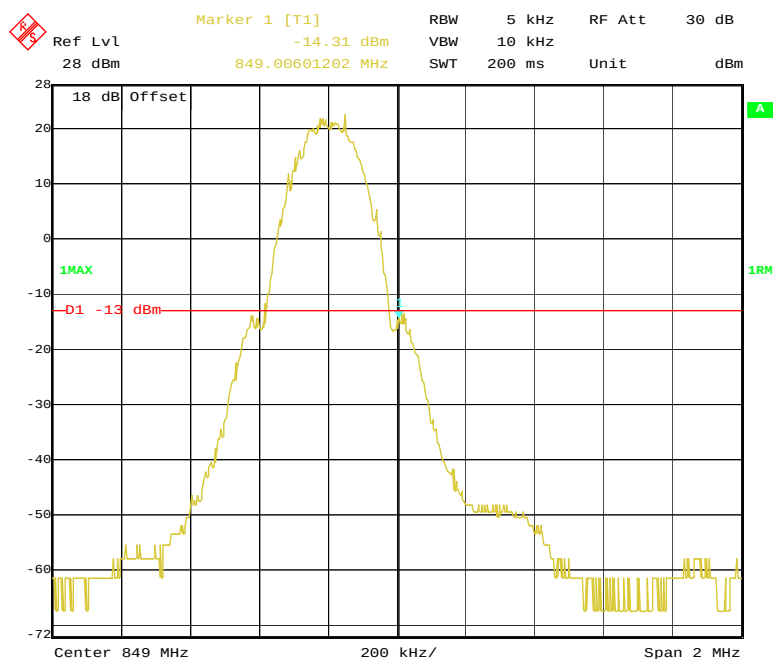
Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

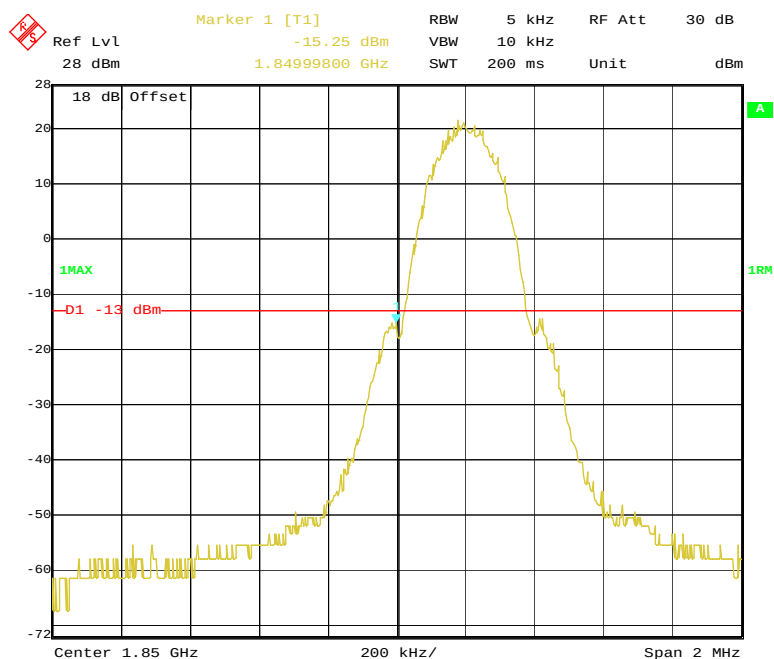
The testing was performed by David. Hsu on 2016-04-28.

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

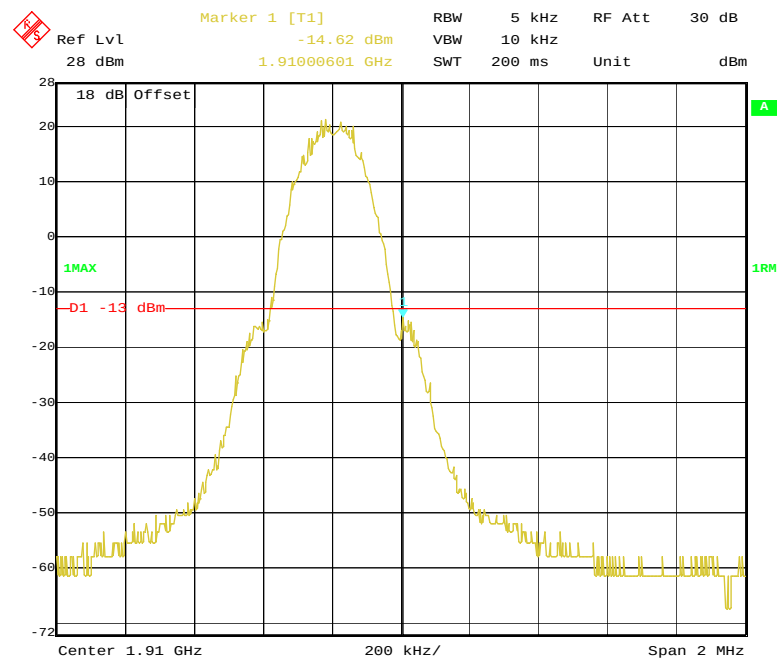
Cellular Band, Right Band Edge for GSM (GMSK) Mode



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



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



FCC§2.1055, §22.355 & §24.235 - FREQUENCY STABILITY

Applicable Standard

FCC§ 2.1055, §22.355, §24.235

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

FrequencyRange (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

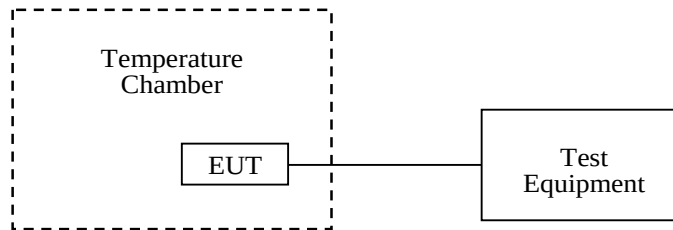
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Interval
BACL	Temperature Chamber	BTH-150	30023	2015-11-12	2016-11-11
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	828590	2015-11-12	2016-11-11
Mini	Splitter	ZFRSC-14-S+	SF019411452	2016-01-11	2016-07-10
Mini	attenuator	10dB	N/A	2016-01-11	2016-07-10
BACL	RF cable	KS-LAB-020	KS-LAB-020	2016-01-11	2016-07-10

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by David. Hsu on 2016-05-07.

EUT operation mode: Transmitting

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

Cellular Band (Part 22H)

Middle Channel, $f_o = 836.6\text{MHz}$				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	4.0	14	0.01673	2.5
-20		11	0.01315	2.5
-10		11	0.01315	2.5
0		15	0.01793	2.5
10		15	0.01793	2.5
20		15	0.01793	2.5
30		14	0.01673	2.5
40		14	0.01673	2.5
50		14	0.01673	2.5
25	V min.= 3.3	15	0.01793	2.5
25	V max.= 4.6	14	0.01793	2.5

PCS Band (Part 24E)

Middle Channel, $f_o = 1880.0\text{MHz}$				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	4.0	25	0.01330	Pass
-20		22	0.01170	Pass
-10		23	0.01223	Pass
0		21	0.01117	Pass
10		22	0.01170	Pass
20		22	0.01170	Pass
30		22	0.01170	Pass
40		28	0.01489	Pass
50		26	0.01383	Pass
25	V min.= 3.3	26	0.01383	Pass
25	V max.= 4.6	28	0.01489	pass

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