

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

For

H2AD

Metrotech Saint-Etienne Metropole, F-42650, St Jean Bonnefonds France

FCC ID: AUJTMG232

Report Type: Original Report	Product Type: Telemedicine Data Transmitter
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* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The H2AD's product, model number: *TMG 232 (FCC ID: AUJTMG232)* (the "EUT") in this report was a *Telemedicine Data Transmitter*, named *Twitoo Telemedicine Gateway*, which was measured approximately: 24.0 cm (L) x 9.7 cm (W) x 5.7 cm (H), rated input voltage: DC 3.7V battery or DC 5.0 V adapter.

Adapter Information: Switching mode adapter
Model No.: UE05WCP-050100SPA;
Part No.: UE100714GWFJ02-P;
Input: AC 100-240V~50/60Hz, 0.2A;
Output: DC 5.0V 1.0A

Frequency Range:

Cellular Band: 824-849 MHz (Tx), 869-894 MHz (Rx)
PCS Band: 1850-1910 MHz (Tx), 1930-1990 MHz (Rx)
Bluetooth: 2402-2480 MHz (Tx/ Rx)

Modulation Mode: GMSK (Cellular/PCS); GFSK (Bluetooth)

Transmitter Output Power:

Cellular Band: 31.43 dBm (Conducted)
PCS Band: 29.97 dBm (Conducted)
Bluetooth: 2.41 dBm (Conducted)

** All measurement and test data in this report was gathered from production sample serial number: 1227060 (Assigned by BACL, Shenzhen). The EUT was received on 2011-12-28.*

Objective

This report is prepared on behalf of H2AD 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 compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, 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: AUJTMG232.

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, ANSI C63.4-2009.

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.

The uncertainty of any RF tests which use conducted method measurement is ± 0.96 dB, the uncertainty of any radiation on emissions measurement is ± 4.0 dB

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA/EIA-603-D.
The GPRS item test was performed with the EUT operating at testing mode.

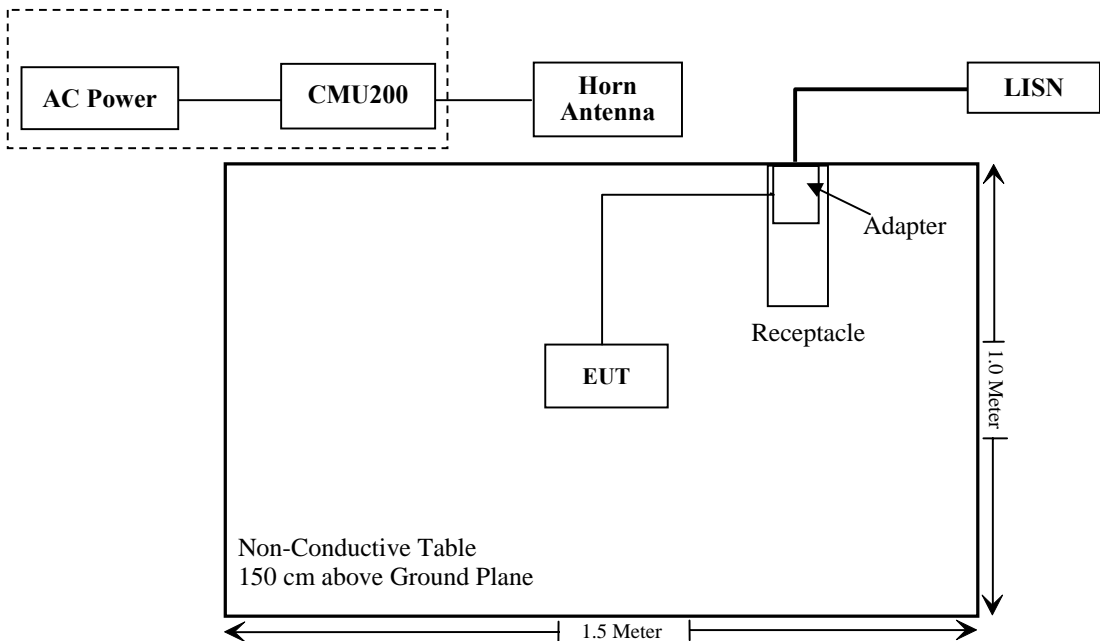
Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R & S	Universal Radio Communication Tester	CMU200	109038

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b)(1), §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	Occupied Bandwidth	Compliance
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	Compliance
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

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

Applicable Standard

According to subpart FCC §1.1307 (b)(1) and §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

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

Test Data

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:

S = 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)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
Cellular Band							
824.2	1	1.259	31.43	1389.95	20	0.348	0.549
PCS Band							
1850.2	-1	0.794	29.97	993.12	20	0.157	1

Result: The device meets FCC MPE limit 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

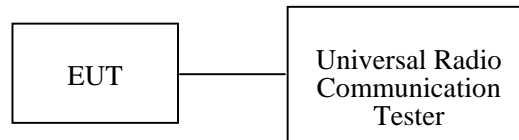
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

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 Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-04
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
HP	Signal Generator	HP8657A	2849U00982	2011-10-28	2012-10-27
HP	Amplifier	HP8447D	2944A09795	2011-08-02	2012-08-02
HP	Synthesized Sweeper	8341B	2624A00116	2011-11-07	2012-11-06
COM POWER	Dipole Antenna	AD-100	041000	2011-09-25	2012-09-25
A.H. System	Horn Antenna	SAS-200/571	135	2011-05-17	2012-05-17

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Leon Chen on 2012-02-08.

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

Mode	Channel	Frequency (MHz)	Output Power (dBm)			
			1 slot	2 slots	3 slots	4 slots
GPRS	128	824.2	31.43	30.15	Not Supported	
	190	836.6	30.96	30.04		
	251	848.8	31.32	30.67		

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Output Power (dBm)			
			1 slot	2 slots	3 slots	4 slots
GPRS	512	1850.2	29.97	29.42	Not Supported	
	661	1880.0	29.84	29.55		
	810	1909.8	29.62	29.23		

ERP & EIRP

ERP for Cellular Band (Part 22H)

Channel	Frequency (MHz)	Indicated		Substituted				Limit (dBm)
		S.A. Reading (dBμV)	Polar (H/V)	S.G. Level (dBm)	Antenna Gain Correction (dBd)	Cable Loss (dB)	Absolute Level (dBm)	
128	824.2	104.32	H	28.00	0.0	0.42	27.60	38.4
		107.62	V	31.32	0.0	0.42	30.90	38.4
190	836.6	103.68	H	27.38	0.0	0.42	26.96	38.4
		106.43	V	30.13	0.0	0.42	29.71	38.4
251	848.8	103.44	H	27.44	0.0	0.42	27.02	38.4
		105.82	V	29.82	0.0	0.42	29.40	38.4

EIRP for PCS Band (Part 24E)

Channel	Frequency (MHz)	Indicated		Substituted				Limit (dBm)
		S.A. Reading (dBμV)	Polar (H/V)	S.G. Level (dBm)	Antenna Gain Correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	
512	1850.2	98.54	H	22.5	7.8	0.91	29.43	33
		100.08	V	23.8	7.8	0.91	30.67	33
661	1880.0	97.69	H	21.4	7.9	0.91	28.38	33
		99.82	V	23.5	7.9	0.91	30.51	33
810	1909.8	98.19	H	21.9	8.1	0.93	29.06	33
		99.88	V	23.6	8.1	0.93	30.75	33

Note: all above data were tested with no amplifier.

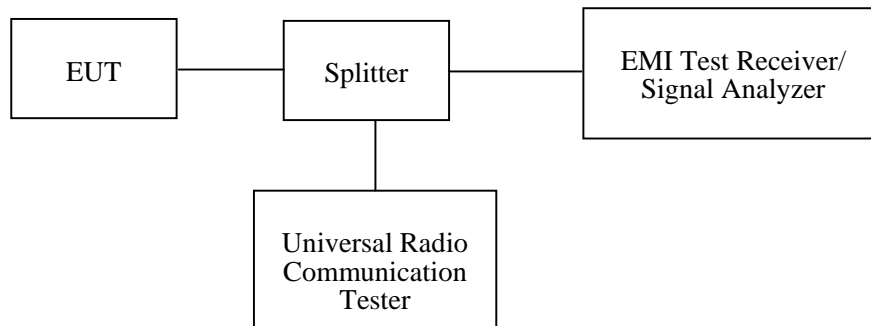
FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH**Applicable Standard**

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

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

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Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56%
ATM Pressure:	100.0kPa

The testing was performed by Leon Chen on 2012-02-08.

Cellular Band (Part 22H)

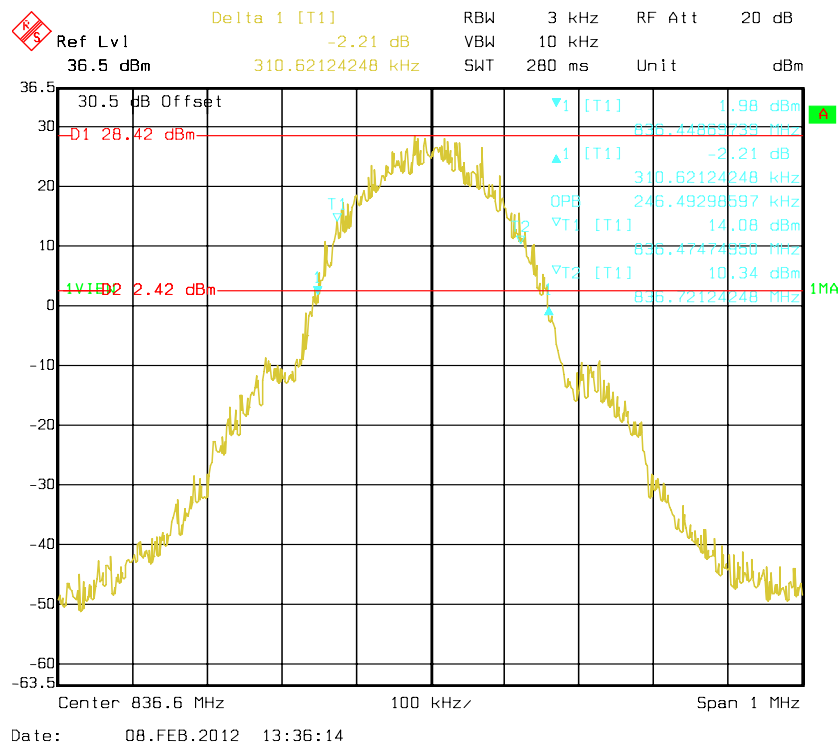
Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Occupied Bandwidth (kHz)
190	836.6	246.4929	310.6212

PCS Band (Part 24E)

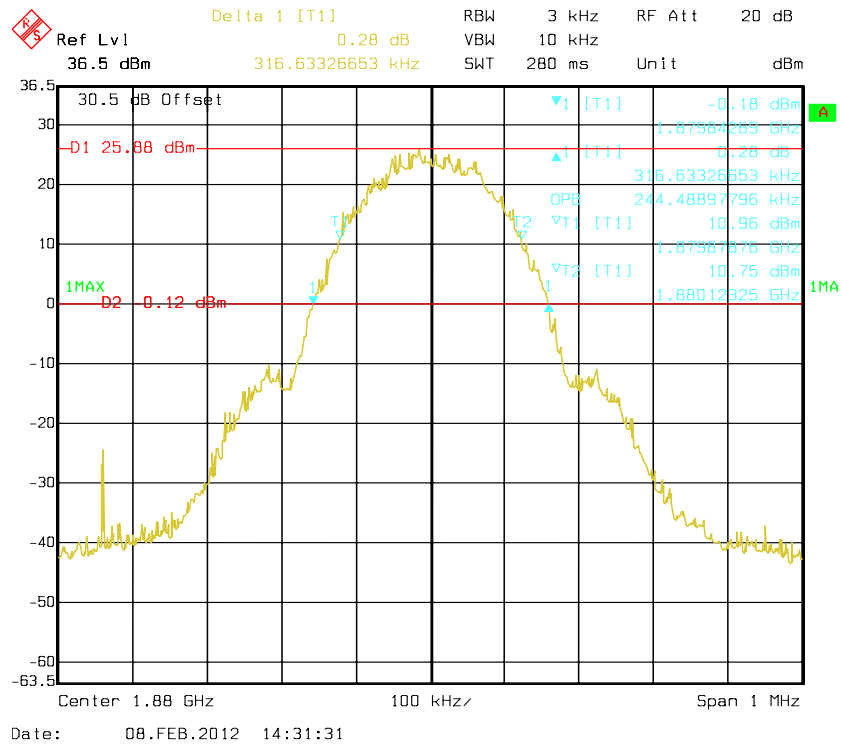
Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Occupied Bandwidth (kHz)
661	1880.0	244.4889	316.6332

Please refer to the following plots.

Cellular Band (Part 22H)



PCS Band (Part 24E)



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

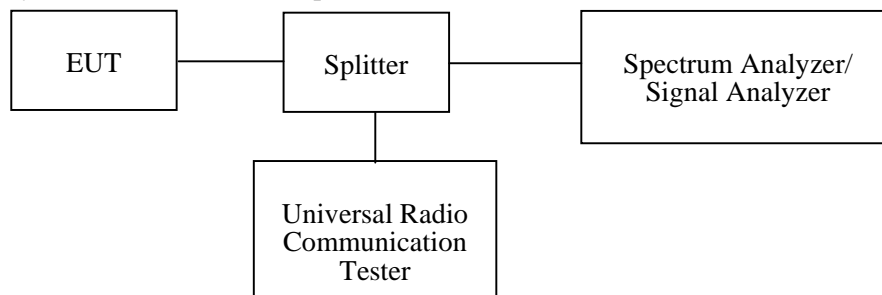
Applicable Standard

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 1 MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

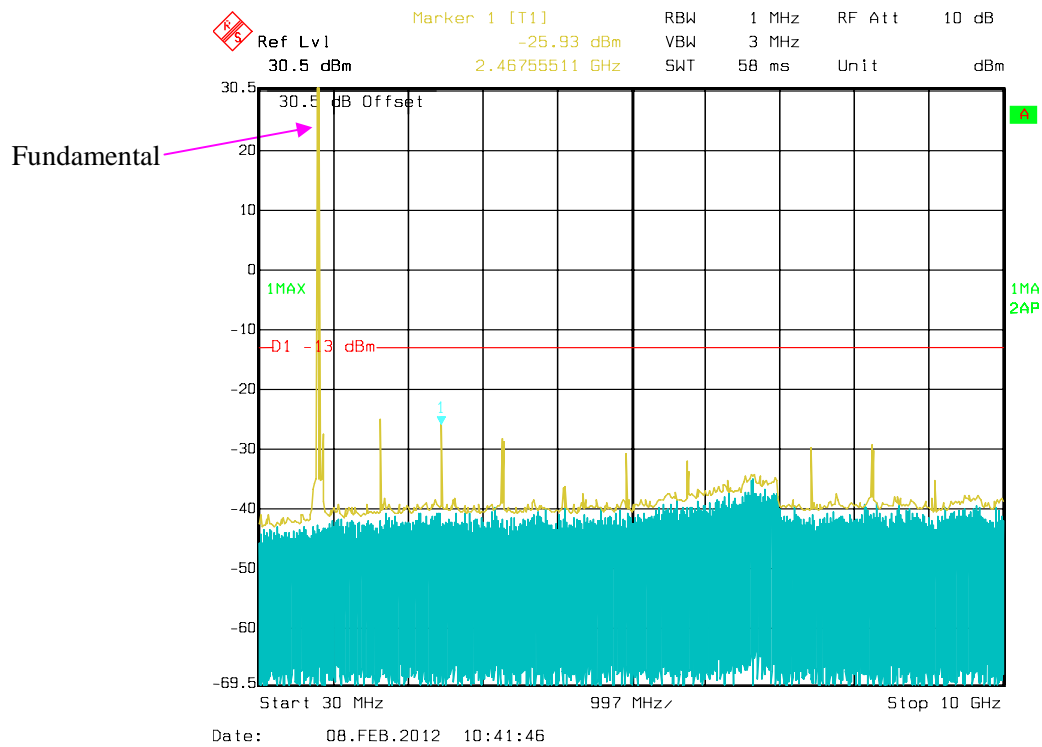
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

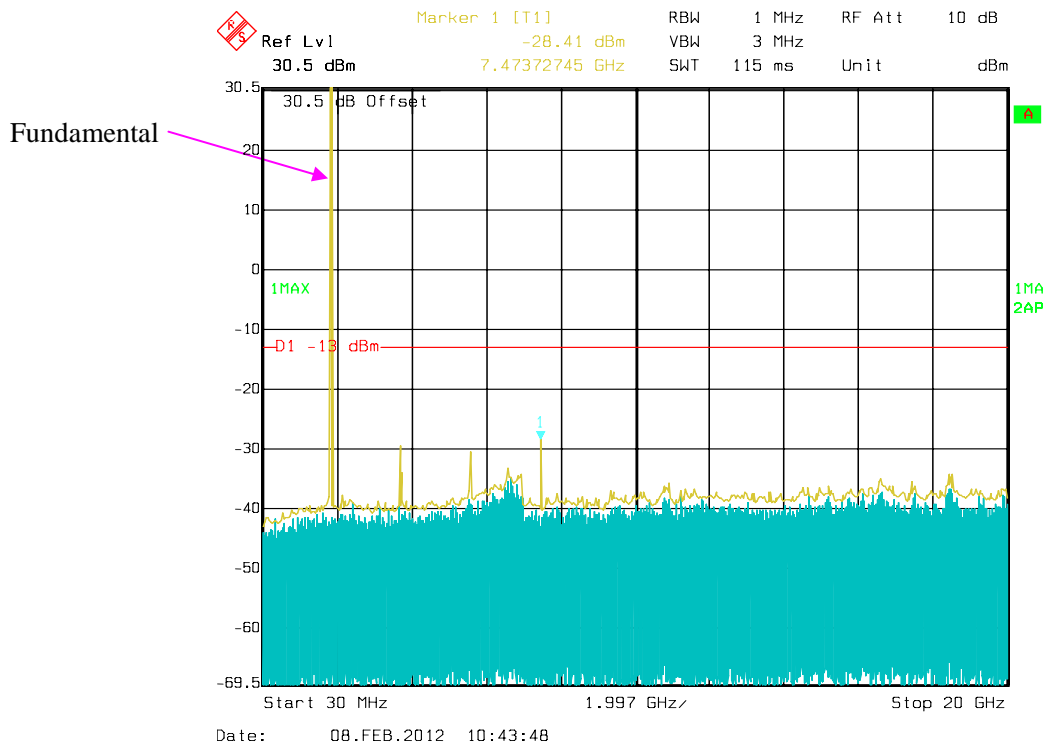
The testing was performed by Leon Chen on 2012-02-08.

Please refer to the following plots.

Cellular Band (Part 22H)



PCS Band (Part 24E)



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

FCC § 2.1053, §22.917 and § 24.238.

Test Procedure

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

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (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 Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
HP	Signal Generator	HP8657A	2849U00982	2011-10-28	2012-10-27
HP	Amplifier	HP8447D	2944A09795	2011-08-02	2012-08-02
HP	Synthesized Sweeper	8341B	2624A00116	2011-11-07	2012-11-06
COM POWER	Dipole Antenna	AD-100	041000	2011-09-25	2012-09-25
A.H. System	Horn Antenna	SAS-200/571	135	2011-05-17	2012-05-17
Electro-Mechanics	Horn Antenna	3116	9510-2270	2011-10-11	2012-10-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Leon Chen on 2012-02-08.

EUT Operation Mode: Transmitting

Cellular Band (Part 22H)**30 MHz-10 GHz**

Frequency (MHz)	Indicated		Substituted				Limit (dBm)	Margin (dB)
	S.A. Reading (dBμV)	Polar (H/V)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)	Absolute Level (dBm)		
High channel (848.8 MHz)								
1697.6	55.14	H	-45.7	8.2	2.32	-39.9	-13	26.86
1697.6	57.63	V	-43.3	8.2	2.32	-37.4	-13	24.37
2546.4	58.26	H	-42.33	8.1	2.51	-36.7	-13	23.74
2546.4	58.47	V	-42.12	8.1	2.51	-36.5	-13	23.53

PCS Band (Part 24E)**30 MHz-20 GHz**

Frequency (MHz)	Indicated		Substituted				Limit (dBm)	Margin (dB)
	S.A. Reading (dBμV)	Polar (H/V)	S.G. Level (dBm)	Antenna Gain (dB)	Cable Loss (dB)	Absolute Level (dBm)		
Low channel(1850.2 MHz)								
3700.4	56.83	H	-44.08	8.6	2.69	-35.5	-13	22.48
3700.4	57.42	V	-43.49	8.6	2.69	-37.6	-13	24.58
5550.6	57.14	H	-46.2	8.3	3.24	-41.1	-13	28.14
5550.6	55.93	V	-42.92	8.3	3.24	-37.9	-13	24.86

Note: For Below 1 GHz, all emissions are below 20 dB of the limit were not recorded.

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

Applicable Standard

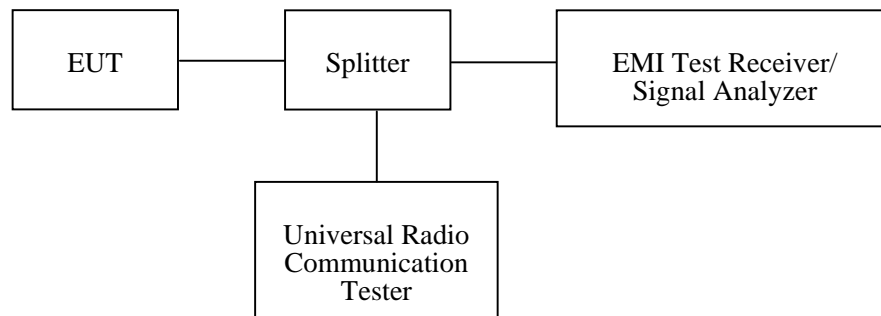
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

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, RBW set to 3 kHz.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Leon Chen on 2012-02-08.

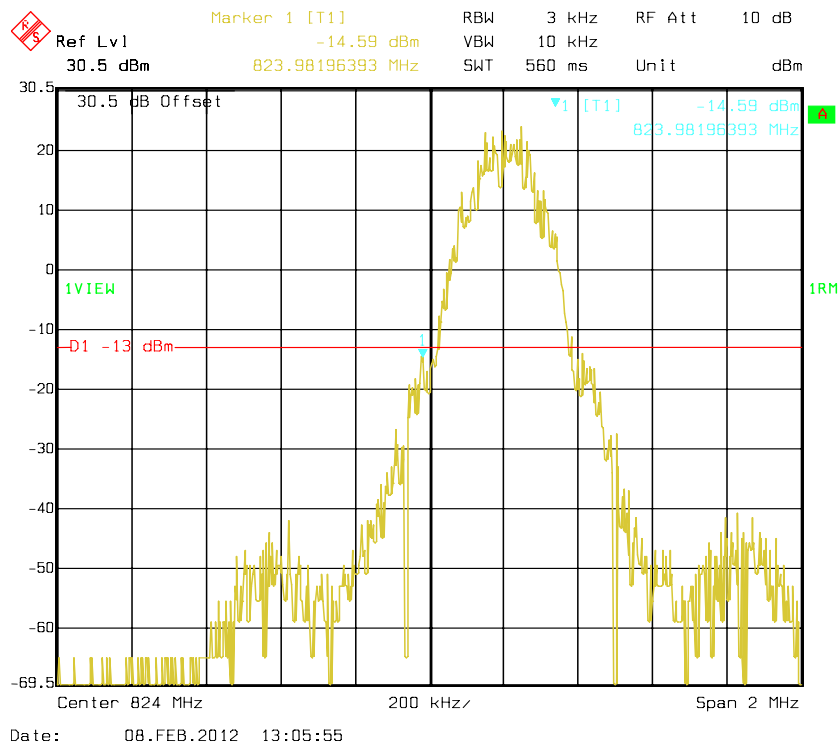
Please refer to the following tables and plots.

Cellular Band (Part 22H)

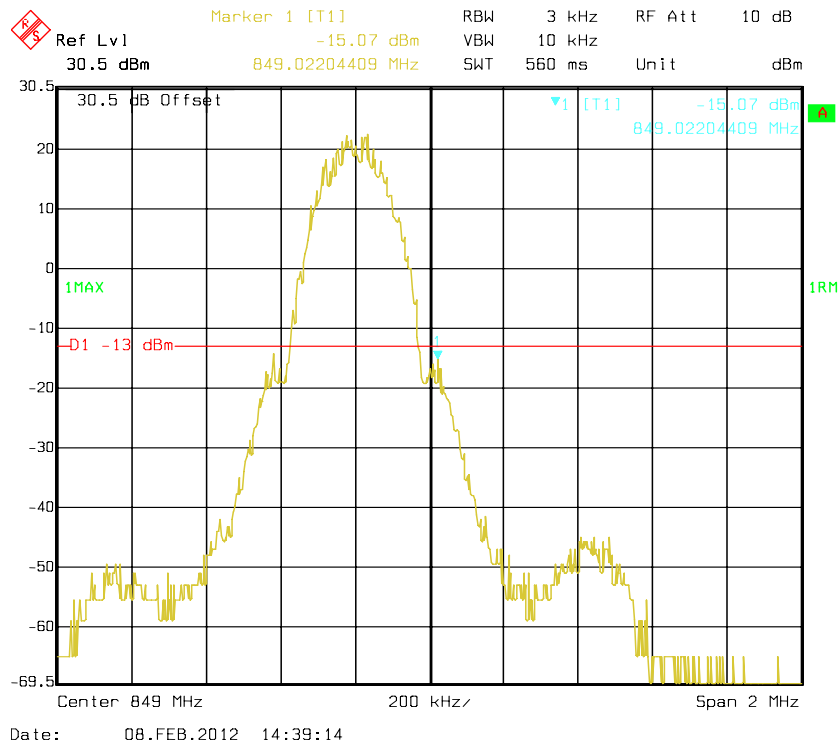
Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.998	-14.59	-13
849.022	-15.07	-13

PCS Band (Part 24E)

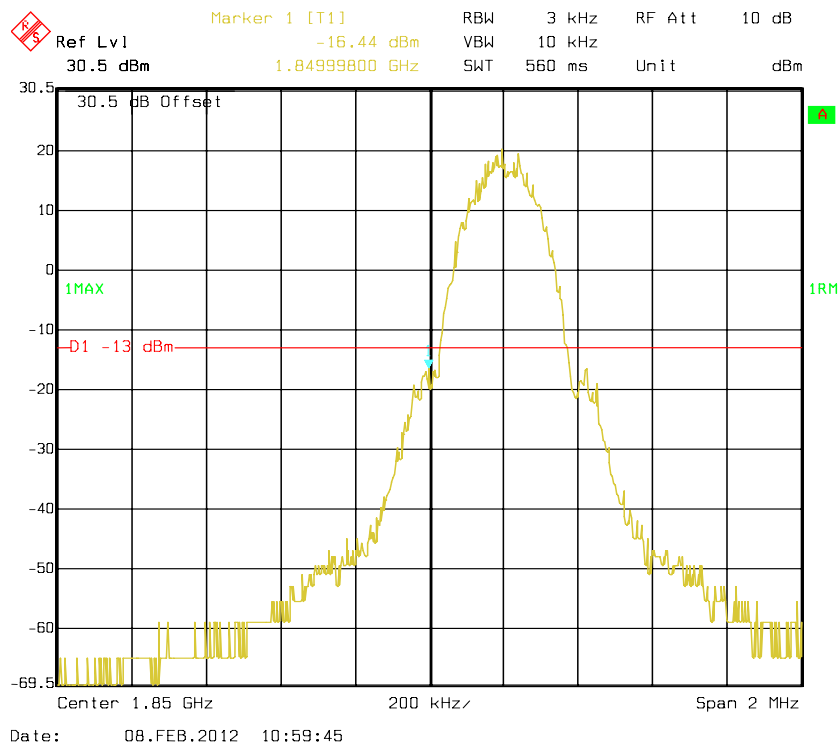
Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.982	-16.44	-13
1910.022	-15.67	-13

Cellular Band, Left Band Edge

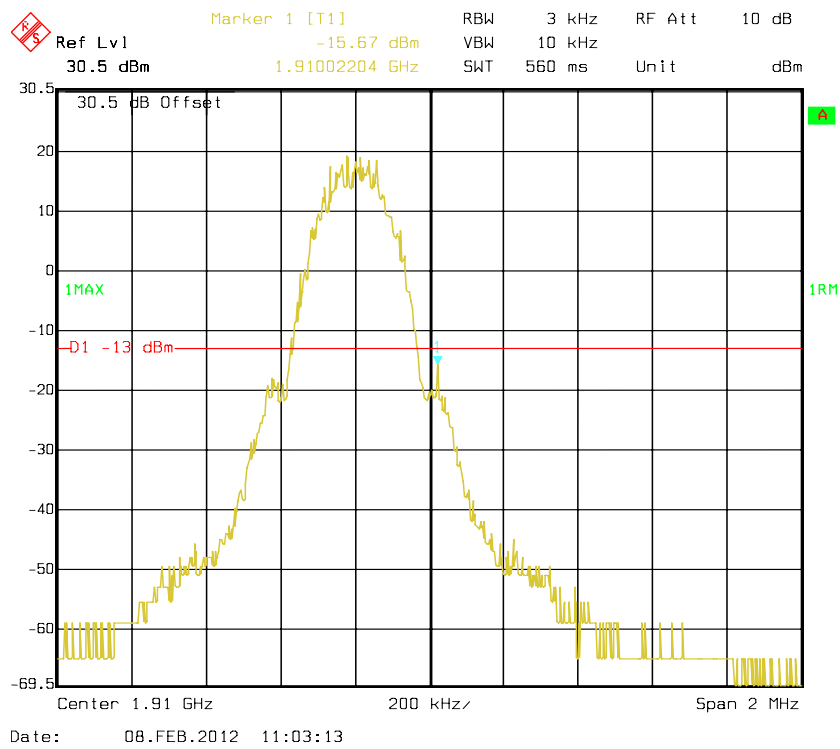
Cellular Band, Right Band Edge



PCS Band, Left Band Edge



PCS Band, Right Band Edge



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

Applicable Standard

FCC § 2.1055 (a), § 2.1055 (d), §22.355, §24.235

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

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

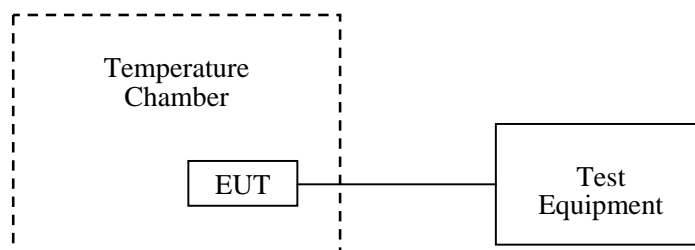
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2011-06-04	2012-06-03
Rohde&Schwarz	Universal Radio Communication Tester	CMU200	109038	2011-04-11	2012-04-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Leon Chen on 2012-03-06.

Cellular Band (Part 22H)

Middle Channel, $f_o = 836.6\text{MHz}$				
Temperature (°C)	Power Supplied (V_{AC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	V=120	-59	-0.0705	2.5
-20		-41	-0.0490	2.5
-10		-21	-0.0251	2.5
0		-19	-0.0227	2.5
10		-22	-0.0263	2.5
20		-32	-0.0383	2.5
30		-41	-0.0490	2.5
40		-50	-0.0598	2.5
50		-76	-0.0908	2.5
20	$V_{high}=138$	-57	-0.0681	2.5
20	$V_{low}=102$	-68	-0.0813	2.5

PCS Band (Part 24E)

Middle Channel, $f_o=1880.0\text{MHz}$				
Temperature (°C)	Power Supplied (V _{AC})	Frequency Error (Hz)	Frequency Error (ppm)	Result
-30	V=120	24	0.0128	pass
-20		21	0.0112	pass
-10		15	0.0080	pass
0		16	0.0085	pass
10		12	0.0064	pass
20		15	0.0080	pass
30		14	0.0074	pass
40		19	0.0101	pass
50		18	0.0096	pass
20	V _{high} =138	19	0.0101	pass
20	V _{low} =102	23	0.0122	pass

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