





FCC PART 22H, 24E
TEST AND MEASUREMENT REPORT

For

ADC Telecommunications Inc.

P.O. Box 1101, Minneapolis, MN 55440, USA

FCC ID: NOO-S2790-011

Report Type: Class II Permissive Change Test Report	Product Type: In Building Wireless Network System
Test Engineer: Dennis Huang 	
Report Number: R1004128-2224	
Report Date: 2010-04-22	
Reviewed By: Boni Baniqued  EMC/RF Supervisor	
Prepared By: Bay Area Compliance Laboratories Corp. (84) 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

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. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, NIST, or any agency of the Federal Government.

* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (800.2)

TABLE OF CONTENTS

1	GENERAL INFORMATION	5
1.1	PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	5
1.2	MECHANICAL DESCRIPTION	5
1.3	EUT PHOTO	5
1.4	OBJECTIVE.....	6
1.5	RELATED SUBMITTAL(S)/GRANT(S).....	6
1.6	TEST METHODOLOGY	6
1.7	MEASUREMENT UNCERTAINTY.....	6
1.8	TEST FACILITY	7
2	SYSTEM TEST CONFIGURATION	8
2.1	JUSTIFICATION	8
2.2	EUT EXERCISE SOFTWARE	8
2.3	EQUIPMENT MODIFICATIONS	8
2.4	SUPPORT EQUIPMENT LIST	8
2.5	LOCAL SUPPORT EQUIPMENT AND SOFTWARE LIST AND DETAILS	8
2.6	INTERNAL CONFIGURATIONS OF EUT.....	8
2.7	INTERFACE PORTS AND CABLES	9
2.8	TEST SETUP BLOCK DIAGRAM.....	9
3	SUMMARY OF TEST RESULTS.....	10
4	FCC §2.1046, §22.913 & §24.232 – RF OUTPUT POWER.....	11
4.1	APPLICABLE STANDARD	11
4.2	TEST PROCEDURE	11
4.3	TEST ENVIRONMENTAL CONDITIONS	11
4.4	TEST EQUIPMENT LIST AND DETAILS	11
4.5	TEST RESULTS	12
5	FCC §2.1047 - MODULATION CHARACTERISTIC.....	13
5.1	APPLICABLE STANDARD	13
5.2	TEST RESULT	13
6	FCC §2.1049, §22.917 & §24.238 - OCCUPIED BANDWIDTH.....	14
6.1	APPLICABLE STANDARD	14
6.2	TEST PROCEDURE	14
6.3	TEST ENVIRONMENTAL CONDITIONS	14
6.4	TEST EQUIPMENT LIST AND DETAILS	14
6.5	TEST RESULTS	15
7	FCC §2.1053, §22.917&§24.238 - SPURIOUS RADIATED EMISSIONS.....	17
7.1	APPLICABLE STANDARD	17
7.2	TEST PROCEDURE	17
7.3	TEST ENVIRONMENTAL CONDITIONS	17
7.4	TEST EQUIPMENT LIST AND DETAILS	18
7.5	TEST SETUP BLOCK DIAGRAM.....	18
7.6	SUMMARY OF TEST RESULTS.....	19
7.7	TEST RESULTS	20
8	FCC §2.1051, §24.238 & §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	21
8.1	APPLICABLE STANDARD	21
8.2	TEST PROCEDURE	21
8.3	TEST ENVIRONMENTAL CONDITIONS	21

8.4	TEST EQUIPMENT LIST AND DETAILS	21
8.5	TEST RESULTS	22
9	FCC §22.917 & §24.238– BAND EDGE.....	25
9.1	APPLICABLE STANDARD	25
9.2	TEST PROCEDURE	25
9.3	TEST ENVIRONMENTAL CONDITIONS	25
9.4	TEST EQUIPMENT LIST AND DETAILS	25
9.5	TEST RESULTS	25
10	FCC §2.1055 – FREQUENCY STABILITY.....	27
10.1	APPLICABLE STANDARD	27
10.2	TEST PROCEDURE	27
10.3	TEST ENVIRONMENTAL CONDITIONS	27
10.4	TEST EQUIPMENT LIST AND DETAILS	27
10.5	TEST RESULTS	28
11	FCC §1.1307(B)(1) & §2.1091 - RF EXPOSURE	29
11.1	APPLICABLE STANDARD	29
11.2	MPE PREDICTION	29
11.3	TEST RESULT	29
12	EXHIBIT A - FCC ID LABELING AND WARNING STATEMENT	30
12.1	FCC ID LABEL REQUIREMENT	30
12.2	FCC ID LABEL	30
12.3	FCC LABEL LOCATION ON EUT	30
13	EXHIBIT B - TEST SETUP PHOTOGRAPHS.....	31
13.1	RADIATED EMISSIONS 30 MHz TO 1 GHz - FRONT VIEW	31
13.2	RADIATED EMISSIONS 30 MHz TO 1GHz - REAR VIEW.....	31
13.3	RADIATED EMISSIONS ABOVE 1 GHz - FRONT VIEW	32
13.4	RADIATED EMISSIONS ABOVE 1GHz - REAR VIEW.....	32
14	EXHIBIT C- EUT PHOTOS.....	33
14.1	EUT FRONT VIEW - MRAU.....	33
14.2	EUT REAR VIEW - MRAU	33
14.3	EUT WITH SUPPORTED EQUIPMENTS FRONT VIEW	34
14.4	EUT WITH SUPPORTED EQUIPMENTS REAR VIEW	34
14.5	SUPPORT EQUIPMENT FRONT VIEW – IFEU.....	35
14.6	SUPPORT EQUIPMENT REAR VIEW – IFEU.....	35
14.7	SUPPORT EQUIPMENT TOP VIEW – URH HOST.....	36
14.8	SUPPORT EQUIPMENT REAR VIEW – URH HOST	36
14.9	SUPPORT EQUIPMENT TOP VIEW – DRU HOST.....	37
14.10	SUPPORT EQUIPMENT REAR VIEW – DRU HOST	37
14.11	SUPPORT EQUIPMENT POWER SUPPLIES FRONT VIEW	38
14.12	SUPPORT EQUIPMENT POWER SUPPLIES REAR VIEW	38
14.13	EUT CASE OFF VIEW - MRAU.....	39
14.14	EUT PCB ASSEMBLY (WITH SHIELDING) TOP VIEW – MRAU (ANT PORTS)	39
14.15	EUT PCB ASSEMBLY (WITHOUT SHIELDING) TOP VIEW – MRAU (ANT PORT).....	40
14.16	EUT PCB ASSEMBLY (WITH SHIELDING) BOTTOM VIEW – MRAU (ANT PORT).....	40
14.17	EUT PCB ASSEMBLY (WITHOUT SHIELDING) BOTTOM VIEW – MRAU (ANT PORT)	41
14.18	EUT PCB ASSEMBLY IF BOARD TOP VIEW – MRAU.....	41
14.19	EUT PCB ASSEMBLY IF BOARD BOTTOM VIEW – MRAU	42
14.20	EUT PCB ASSEMBLY IF BOARD (WITHOUT SHIELDING) BOTTOM VIEW – MRAU	42
15	APPENDIX A – DECLARATION OF SIMILARITY	43

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1004128-2224	Original Report	2010-04-22

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The ADC Telecommunications, Inc. FCC ID: NOO-S2790-011, Model: SPT- M1-8519-1 850/1900 Master RAU or the "EUT" as referred to in this report is a wireless network systems operate in the Cellular/PCS bands and supports GSM, WCDMA, and CDMA modulation. It is a flexible multi-operator/multi-protocol single platform system supporting up to 8 Radio Frequency (RF) bands. It consists of a Host Unit, an Expansion Unit (comprised of a DART Remote Module (DRU), IF Expansion Module (IFEU), and Power Supply), and Remote Amplifiers Units (RAUs). The Host, DRU and IFEU are intended for telecom closet indoor use. The RAU is intended to be installed above a false ceiling in an environmentally controlled office.

1.2 Mechanical Description

(MRAU) measures approximately 211 mm (L) x 272 mm (W) x 76 mm (H), and weighs approximately 3.4 kg.

**The test data gathered are from production sample, serial number: RAU 13 (MRAU), provided by the manufacturer.*

1.3 EUT Photo



Please refer to Exhibit C for more EUT photographs.

1.4 Objective

This type approval report is prepared on behalf of *ADC Telecommunications, Inc.* in accordance with Part 2, Subpart J, Part 22, Subpart H, and Part 24, Subpart E of the Federal Communication Commissions rules.

The objective is to determine continuous compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, band edge, and conducted and radiated margin.

The purpose of this Class II Permissive Change report is to add a GSM modulation to the Cellular 850 and PCS 1900 band in the system. The original application (FCC ID: NOO-S2790-011, certified on 2010-01-18) included Cellular band with CDMA and WCDMA modulation and PCS band with CDMA and WCDMA modulation.

1.5 Related Submittal(s)/Grant(s)

For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-011, Report Number: R1003018-2427, the similarity declaration has been provided in Appendix A as attached.

For CDMA and WCDMA Measurements please refer to FCC ID: NOO-S2790-011, Report Number: R1001123-2427

1.6 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 – PCS

Applicable Standards: TIA/EIA-603-C, ANSI C63.4-2003.

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

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from +2.0 dB for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and

December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: R-2463 and C-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

2 SYSTEM TEST CONFIGURATION

2.1 Justification

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

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

2.2 EUT Exercise Software

Signal was sent through EUT using a signal generator; device was set to normal operating mode.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Support Equipment List

Manufacturer	Description	Model	Serial Number
ADC Telecommunication	URH	-	MDF3O18A
ADC Telecommunication	DRH	-	7109A00S
Unipower Corporation	AC/DC Power Supply	TPCR1V3C-Z	24090T0019
ADC Telecommunication	IF Expansion Module	-	S/N7

2.5 Local Support Equipment and Software List and Details

Manufacturer	Description	Model	Serial Number
Agilent	MXG Vector Signal Generator	N5182A	MY47420502

2.6 Internal Configurations of EUT

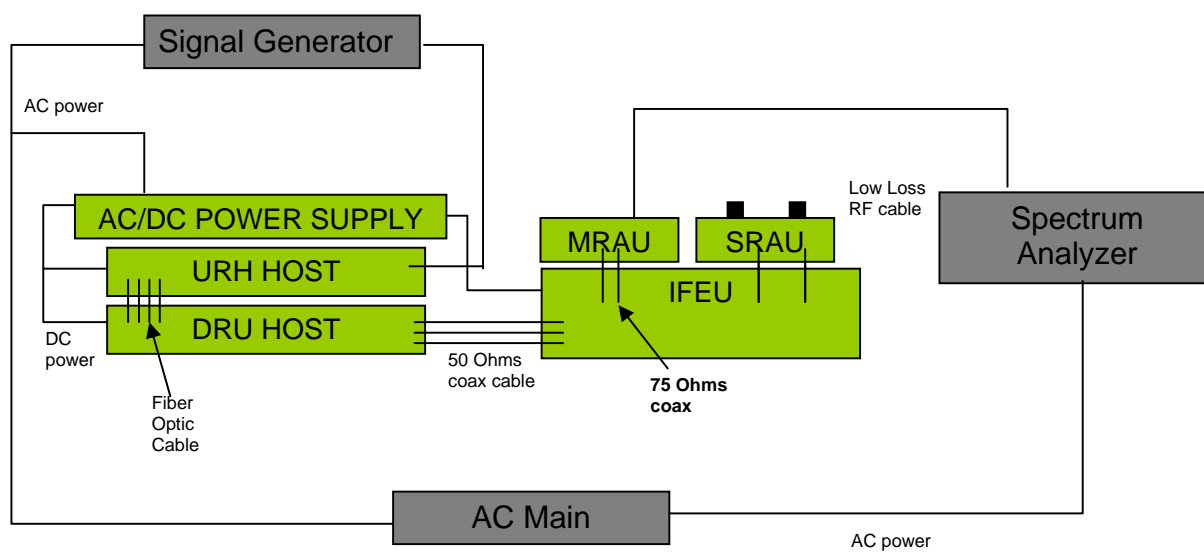
Manufacturer	Description	Model	Serial Number
ADC Telecommunication	MRAU RF Cell PCB Board	712750-0 REV2.3	R0931G0014NC
ADC Telecommunication	MRAU RF PCS PCB Board	712755-0 REV4	R0929G0015NC
ADC Telecommunication	MRAU IF PCB Board	712750-1 REV4	R0933G0005NC

2.7 Interface Ports and Cables

Cable Description	Length (m)	To	From
Shielded Cable (Duplex Fiber Optic)	3	Host Unit	DRU (Dart Remote Unit)
75 Ohm Coax Cable	100	IF Expansion Unit (IFEU)	MRAU
50 ohm CATV cable	< 1	DRU	IF Expansion Unit
RF Cable	< 1	Main Hub/RAU	Spectrum Analyzer
RF Cable	< 1	Main Hub/RAU	Signal Generator

2.8 Test Setup Block Diagram

Bench Testing



3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§2.1046, §22.913, §24.232	RF Output Power	Compliant*
§2.1047	Modulation Characteristics	N/A
§2.1049, §22.917, §24.238	Occupied Bandwidth / Out of Band Emissions	Compliant*
§ 2.1053, §22.917, §24.238	Spurious Radiated Emissions	Compliant
§2.1051, §22.917, §24.238	Spurious Emissions at Antenna Terminals	Compliant*
§22.917, §24.238	Band Edge	Compliant*
§2.1055	Frequency Stability	Compliant*
§2.1091	RF Exposure	Compliant*

Note: * For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-001, Report Number: R1003018-2427

Please refer to the Appendix A for the declaration of similarity.

4 FCC §2.1046, §22.913 & §24.232 – RF OUTPUT POWER

4.1 Applicable Standard

FCC §22.913 & §24.232

4.2 Test Procedure

Conducted:

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

4.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	50-59 %
ATM Pressure:	99-102kPa

** The testing was performed by Dennis Huang on 2010-04-05 at RF Site.*

4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	N5182A	MY47420502	2009-09-18

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

4.5 Test Results

Maximum Output Power – Modulated Signal

Radio Mode	Band	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)
GSM	Cellular 850 MHz	Low	869.2	14.87	30.69
		Middle	881.6	14.98	31.48
		High	893.8	14.88	30.76
GSM	PCS 1900 MHz	Low	1930.2	14.89	30.83
		Middle	1960.0	14.98	31.48
		High	1989.8	14.83	30.41

Note: For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-001, Report Number: R1003018-2427

5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC §2.1047(d), there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

5.2 Test Result

N/A

6 FCC §2.1049, §22.917 & §24.238 - OCCUPIED BANDWIDTH

6.1 Applicable Standard

Requirements: FCC §2.1049, §22.917 and §24.238.

6.2 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 to at least 1% of the BW (Cellular/PCS) and the 26 dB & 99% bandwidth was recorded.

6.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	50-59 %
ATM Pressure:	99-102kPa

* The testing was performed by Dennis Huang on 2010-04-05 at RF Site.

6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	N5182A	MY47420502	2009-09-18

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.5 Test Results

GSM Modulation:

Mode		Channel	Frequency (MHz)	Emission Bandwidth (kHz)
GSM (Cellular)	Downlink	Low	869.2	312.30
		Middle	881.6	314.11
		High	893.8	311.56
GSM (PCS)	Downlink	Low	1930.2	315.418
		Middle	1960.0	314.313
		High	1989.8	311.265

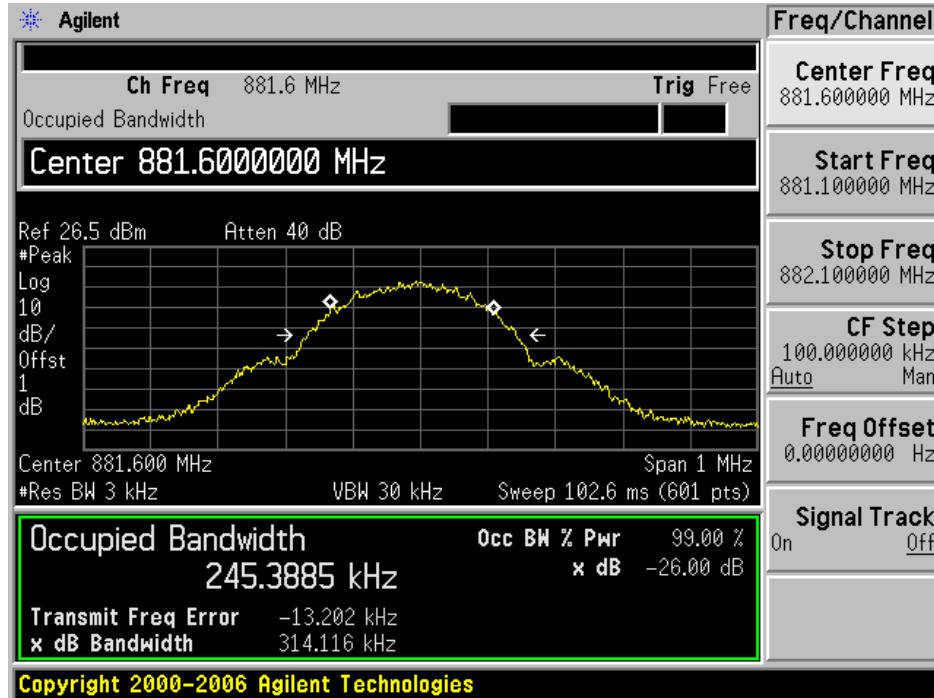
Note: For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-001, Report Number: R1003018-2427

Please refer to the following plots for details.

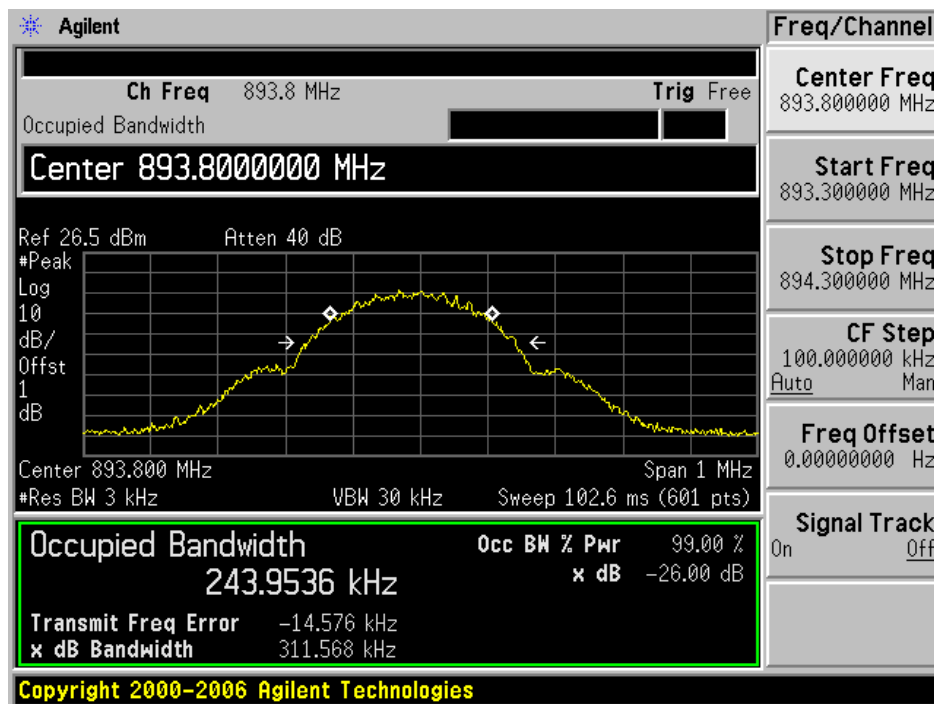
GSM, Downlink, Low Channel: 869.2 MHz



GSM, Downlink, Middle Channel: 881.6 MHz



GSM, Downlink, High Channel: 893.8 MHz



7 FCC §2.1053, §22.917&§24.238 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

FCC §2.1053, §22.917 §22.238 and § 24.238.

7.2 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 = $10 \log (\text{TX Power in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \log_{10} (\text{power out in Watts})$

7.3 Test Environmental Conditions

Temperature:	21~23.5 °C
Relative Humidity:	43~59 %
ATM Pressure:	98~101.7kPa

**The testing was performed by Dennis Huang on 2010-03-26 in 5 Meter Chamber #3.*

7.6 Summary of Test Results

The worst case reading as follows:

Cellular Band:

Mode: GSM, Downlink		
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)
-25.12	7362	Horizontal

PCS Band:

Mode: GSM, Downlink		
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)
-22.77	7362	Horizontal

Please refer to the following tables for detailed results.

7.7 Test Results

Cellular Band

GSM ~ Downlink (frequency = 881.6 MHz)

Indicated		Table Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1105.9	63.34	356	1.22	V	1105.9	-49.29	6.6	1	-50.29	-13	-37.29
1105.9	61.91	9	1.41	H	1105.9	-50.72	6.6	1	-51.72	-13	-38.72
3072	50.62	334	1.71	V	3072	-53.28	9.6	1.68	-54.96	-13	-41.96
3072	55.72	19	1.67	H	3072	-48.18	9.6	1.68	-49.86	-13	-36.86
4869	51.87	64	1.33	V	4869	-43.13	10.7	2	-45.13	-13	-32.13
4869	47.91	348	1.0	H	4869	-47.09	10.7	2	-49.09	-13	-36.09
7362	58.69	8	1.0	V	7362	-35.22	8.5	3	-38.22	-13	-25.22
7362	58.79	314	1.16	H	7362	-35.12	8.5	3	-38.12	-13	-25.12
50	68.54	354	1.0	V	50	-41.33	0	0.5	-41.83	-13	-28.83
50	58.69	360	2.15	H	50	-51.18	0	0.5	-51.68	-13	-38.68
106.75	64.15	88	1.81	V	106.75	-45.51	0	0.5	-46.01	-13	-33.01
106.75	61.23	254	1.0	H	106.75	-48.43	0	0.5	-48.93	-13	-35.93

PCS Band

GSM ~ Downlink (frequency = 1960 MHz)

Indicated		Table Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
1105.9	62.02	356	1.22	V	1105.9	-50.61	6.6	1	-51.61	-13	-38.61
1105.9	62.94	9	1.41	H	1105.9	-49.69	6.6	1	-50.69	-13	-37.69
3072	50.41	334	1.71	V	3072	-53.49	9.6	1.68	-55.17	-13	-42.17
3072	52.26	19	1.51	H	3072	-51.64	9.6	1.68	-53.32	-13	-40.32
4869	51.74	64	1.33	V	4869	-43.26	10.7	2	-45.26	-13	-32.26
4869	48.29	348	1.0	H	4869	-46.71	10.7	2	-48.71	-13	-35.71
7362	59.16	8	1.0	V	7362	-34.75	8.5	3	-37.75	-13	-24.75
7362	61.14	317	1.05	H	7362	-32.77	8.5	3	-35.77	-13	-22.77
50	68.44	355	1.0	V	50	-41.43	0	0.5	-41.93	-13	-28.93
50	59.2	360	2.17	H	50	-50.67	0	0.5	-51.17	-13	-38.17
106.75	65.55	88	1.81	V	106.75	-44.11	0	0.5	-44.61	-13	-31.61
106.75	62.48	255	1.0	H	106.75	-47.18	0	0.5	-47.68	-13	-34.68

8 FCC §2.1051, §24.238 & §22.917 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Applicable Standard

Requirements: FCC §2.1051, §22.917 & §24.238.

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

§22.917, and §24.238: 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

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

8.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	50-59 %
ATM Pressure:	99-102kPa

* The testing was performed by Dennis Huang on 2010-04-05 at RF Site.

8.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	N5182A	MY47420502	2009-09-18

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

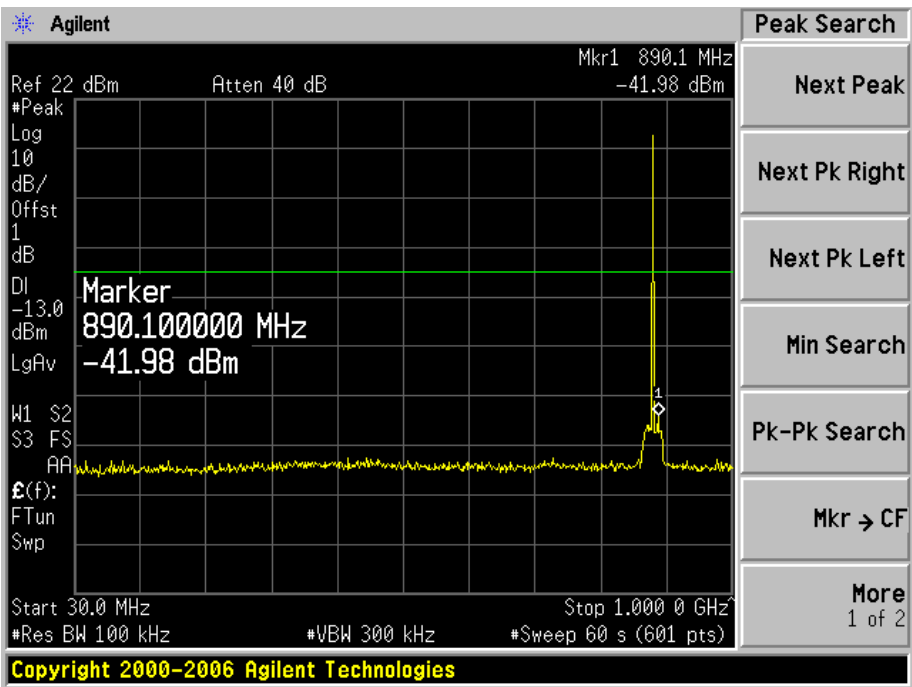
8.5 Test Results

Please refer to the following plots for test results of Cellular band GSM modulation.

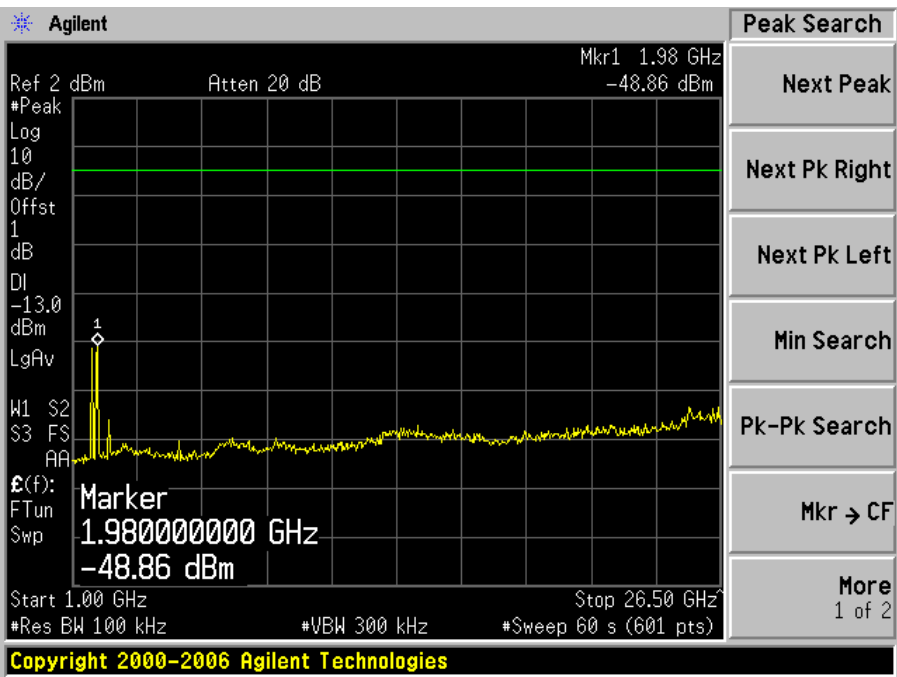
Note: For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-001, Report Number: R1003018-2427

GSM Cellular Band Downlink, Middle Channel: 881.6 MHz:

Plot 1: 30 MHz to 1 GHz

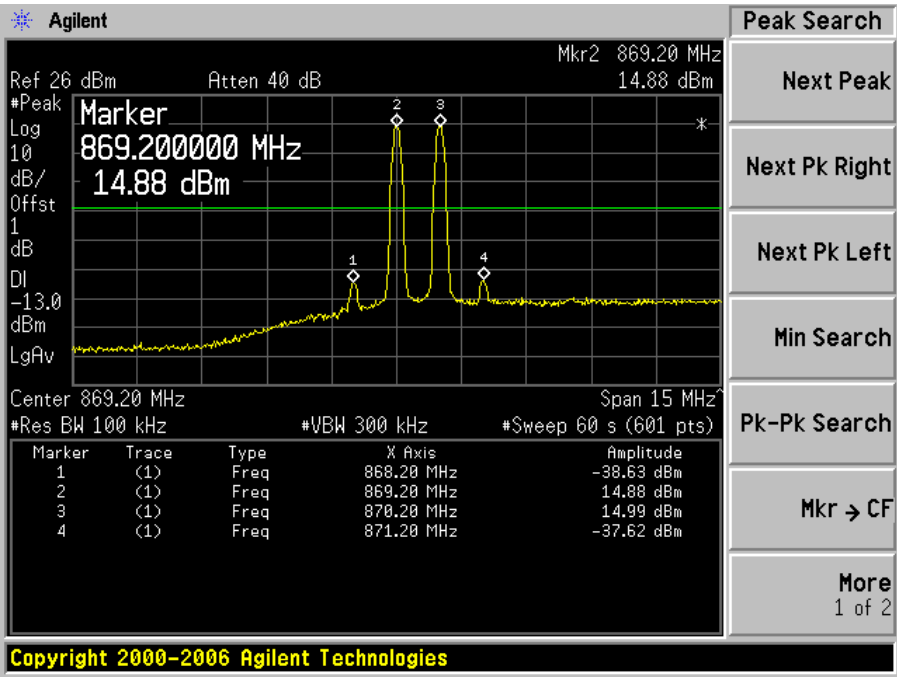


Plot 2: Above 1 GHz

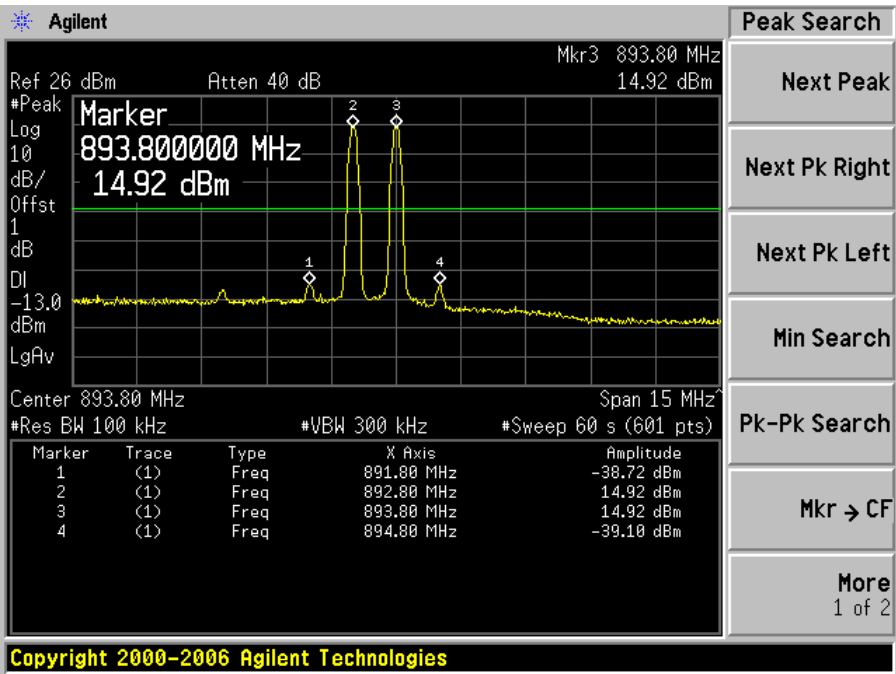


Inter-modulation:

GSM Cellular Band Downlink, Low Channel: 869.2 MHz:



GSM Cellular Band Downlink, High Channel: 893.8 MHz:



9 FCC §22.917 & §24.238– BAND EDGE

9.1 Applicable Standard

According to FCC §22.917 and §24.238, 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.

9.2 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.

9.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	50-59 %
ATM Pressure:	99-102kPa

* The testing was performed by Dennis Huang on 2010-04-05 at RF Site.

9.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	N5182A	MY47420502	2009-09-18

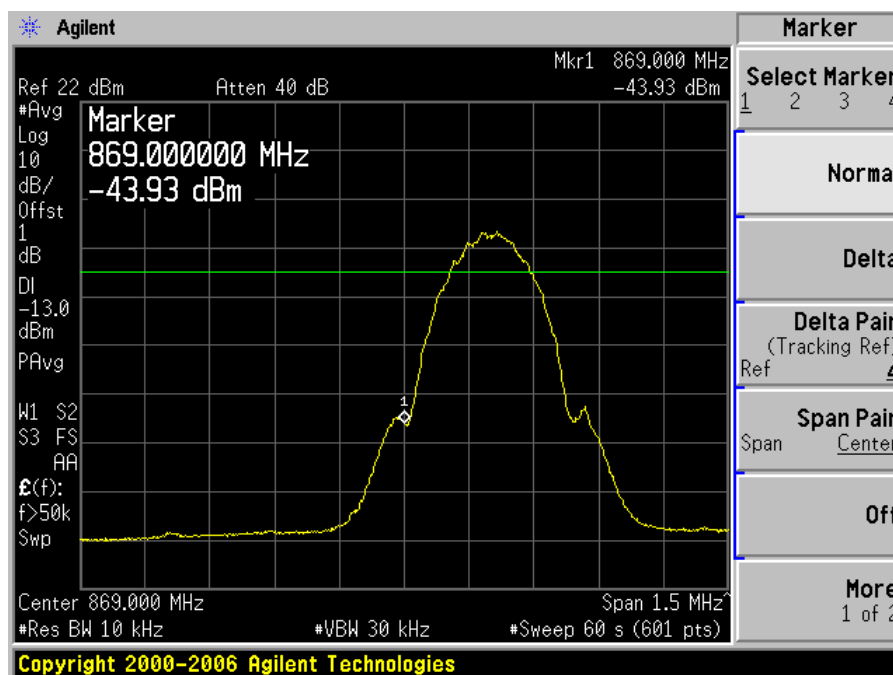
* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

9.5 Test Results

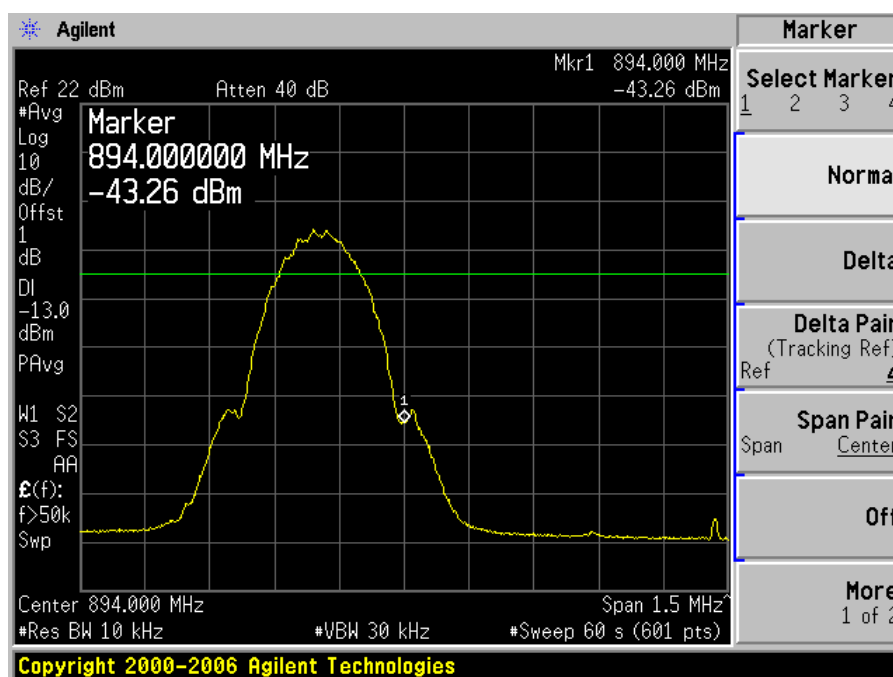
Please refer to the following plots for test results of Cellular band GSM modulation.

Note: For PCS Band Conducted Measurements of GSM modulation please refer to FCC ID: NOO-S2784-001, Report Number: R1003018-2427

GSM Cellular Band Downlink: Lowest Channel



GSM Cellular Band Downlink: Highest Channel



10 FCC §2.1055 – FREQUENCY STABILITY

10.1 Applicable Standard

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

10.2 Test Procedure

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.000\ 25\ %$ ($\pm 2.5\ \text{ppm}$) of the center frequency.

CW was tested as worst case.

10.3 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	50-59 %
ATM Pressure:	99-102kPa

* The testing was performed by Dennis Huang on 2010-04-05 at RF Site.

10.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	MXG Vector Signal Generator	N5182A	MY47420502	2009-09-18
Tenney	Temperature Oven	Versa Tenn	12.431-8	N/A

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

10.5 Test Results

Cellular 850 Band, Downlink

The EUT is tested at 881.6 MHz with CW

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Frequency Error (ppm)
102	-84	-0.1004
120	-91	-0.1087
138	-80	-0.0956

(Frequency Drift with Supply Temperature Variation)

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
50	-74	-0.088
-20	-74	-0.088

11 FCC §1.1307(b)(1) & §2.1091 - RF EXPOSURE

11.1 Applicable Standard

According to §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

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 (minute)
Limits for General Population/Uncontrolled Exposure				
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

11.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

11.3 Test Result

Cellular 850 Band, downlink:

Maximum peak output power at antenna input terminal (dBm):	<u>14.98</u>
Maximum peak output power at antenna input terminal (mW):	<u>31.477</u>
Prediction distance (cm):	<u>20</u>
Prediction frequency (MHz):	<u>881.6</u>
Antenna Gain, typical (dBi):	<u>8.0</u>
Maximum Antenna Gain (numeric):	<u>6.31</u>
Power density at predication frequency and distance (mW/cm ²):	<u>0.0432</u>
MPE limit for uncontrolled exposure at predication frequency (mW/cm ²):	<u>0.588</u>

For Downlink, the highest power density level at 20 cm is 0.0432 mW/cm², which is below the uncontrolled exposure limit.

Note: Antenna gain is restricted to 1.5 Watt ERP (2.49 Watt EIRP) in order to satisfy RF exposure compliance requirements. If higher than 1.5 Watt ERP, routine MPE evaluation is needed. The antennas should be installed to provide at least 20 cm from all persons to satisfy MPE requirements of FCC Part 2, 2.1091.