



Zonar Systems, LLC

V3R

FCC 22H:2013

FCC 24E:2013

FCC 15.109:2013

Report #: ZONA0044



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

Last Date of Test: April 1, 2013
Zonar Systems, LLC
Model: V3R

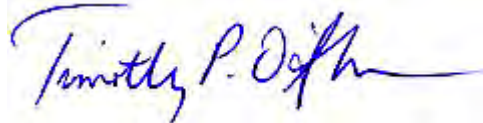
Emissions

Test Description	Specification	Test Method	Pass/Fail
Effective Radiated Power (ERP)	FCC 22H:2013	ANSI/TIA/EIA-603-C-2004	Pass
Effective Radiated Power (EIRP)	FCC 24E:2013	ANSI/TIA/EIA-603-C-2004	Pass
Transmitter Spurious Emissions	FCC 22H:2013	ANSI/TIA/EIA-603-C-2004	Pass
Transmitter Spurious Emissions	FCC 24E:2013	ANSI/TIA/EIA-603-C-2004	Pass
Receiver Spurious Emissions	FCC 15.109:2013 Class B	ANSI C63.4:2009	Pass

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager



NVLAP Lab Code: 200676-0

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
41 Tesla Ave.
Irvine, CA 92618

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834B-1).

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

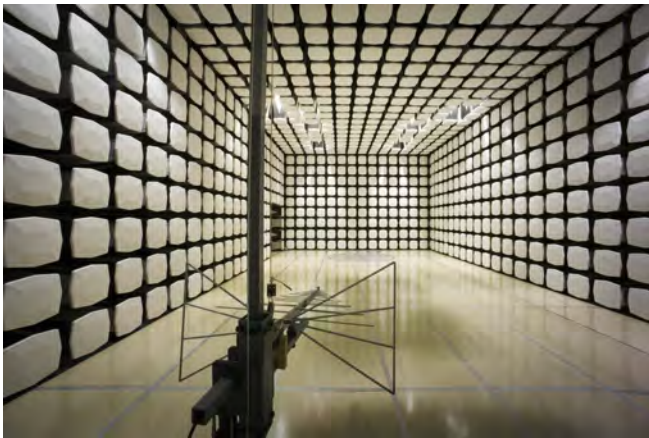
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94



Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05, SU02, SU07 19201 120 th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0



Client and Equipment Under Test (EUT) Information

Company Name:	Zonar Systems, LLC
Address:	18200 Cascade Ave. S Suite, 200
City, State, Zip:	Seattle, WA 98188
Test Requested By:	David Pascoe
Model:	V3R
First Date of Test:	February 22, 2013
Last Date of Test:	April 1, 2013
Receipt Date of Samples:	February 11, 2013
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

It is a heavy-vehicle mounted telematics device that gathers vehicle data (GPS location, vehicle diagnostic information, etc.) and sends the data to the Zonar database servers via a 2G/3G GSM modem. It also includes an 802.11 b/g/n radio module. The entire system is enclosed in a ruggedized waterproof enclosure. The cellular modem (GSM radio) is based on the Sierra Wireless, Model SL8080 Modem, FCC ID: N7NSL8080.

Testing Objective:

Testing is being performed in pursuit of new approval that for the original system that is it now being placed in a new ruggedized enclosure. Through a KDB inquiry, the FCC stated that this requires a new certification.

Configuration ZONA0044- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Vehicle Base Module w/Ruggedized Waterproof Enclosure	Zonar Systems, LLC	V3R	40000000046

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Power Supply	EZ Digital Co. Ltd.	DC Power Supply	01070029

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop Computer	Dell Corporation	RPO5L	8557805701

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.0m	No	Vehicle Base Module w/Ruggedized Waterproof Enclosure	DC Power Supply
Serial Cable (4pin)	No	3.0m	No	Vehicle Base Module w/Ruggedized Waterproof Enclosure	Dell Laptop
Serial Cable (8pin)	No	3.0m	No	Vehicle Base Module w/Ruggedized Waterproof Enclosure	Dell Laptop
AC Cable	No	1.8m	No	DC Power Supply	AC Mains
Cable Adapter	No	0.9m	No	Vehicle Base Module w/Ruggedized Waterproof Enclosure	Cables
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration ZONA0046- 1

Software/Firmware Running during test	
Description	Version
HyperTerminal	1999

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Vehicle Base Module w/Ruggedized Waterproof Enclosure	Zonar Systems, LLC	V3	40000000046

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
DC Power Supply	Topward	TPS-2000	946425
Universal SIM Card	Agilent	E5515-10008	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop Computer	IBM	ThinkPad A21m	HKYY6

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power	No	2.0m	No	Cable Harness	DC Power Supply
Serial - GSM Control	No	3.0m	No	Cable Harness	Laptop Computer
Serial - WiFi Control	No	3.0m	No	Cable Harness	Unterminated
AC Power	No	1.8m	No	DC Power Supply	AC Mains
Cable Harness	No	0.9m	No	Vehicle Base Module w/Ruggedized Waterproof Enclosure	DC Power & Serial Cables

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/22/2013	Receiver Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	3/27/2013	Effective Radiated Power (ERP)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	3/28/2013	Effective Radiated Power (EIRP)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	4/1/2013	Transmitter Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting Cell Band (GSM850), EGPRS, MCS-9
Transmitting Cell (Band V), WCDMA Rel 99, All up bits
Transmitting Cell Band (GSM850), GPRS, CS-4

POWER SETTINGS INVESTIGATED

13.8 VDC

CONFIGURATIONS INVESTIGATED

ZONA0046 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 824 MHz Stop Frequency 849 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0 mo
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	3/25/2013	12 mo
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0 mo
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24 mo
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24 mo
Antenna, Dipole	ETS	3121C-DB4	ADH	NCR	36 mo
Antenna, Horn	EMCO	3115	AHE	NCR	0 mo
EV01 Cables	N/A	Bilog Cables	EVA	6/26/2012	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The fundamental emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization. The amplitude and frequency of the highest emission were noted. The EUT was then replaced with a ½ wave dipole that was successively tuned to the highest emission. A signal generator was connected to the dipole, and its output was adjusted to match the level previously noted for each frequency. The output of the signal generator was recorded. The signal generator, amplifier, and cable were then connected to an analyzer and the power output was recorded. By factoring in the dipole antenna gain (dBi), the effective radiated power for the maximum fundamental emission was determined. The ERP value was obtained from taking the value in EIRP – 2.15.



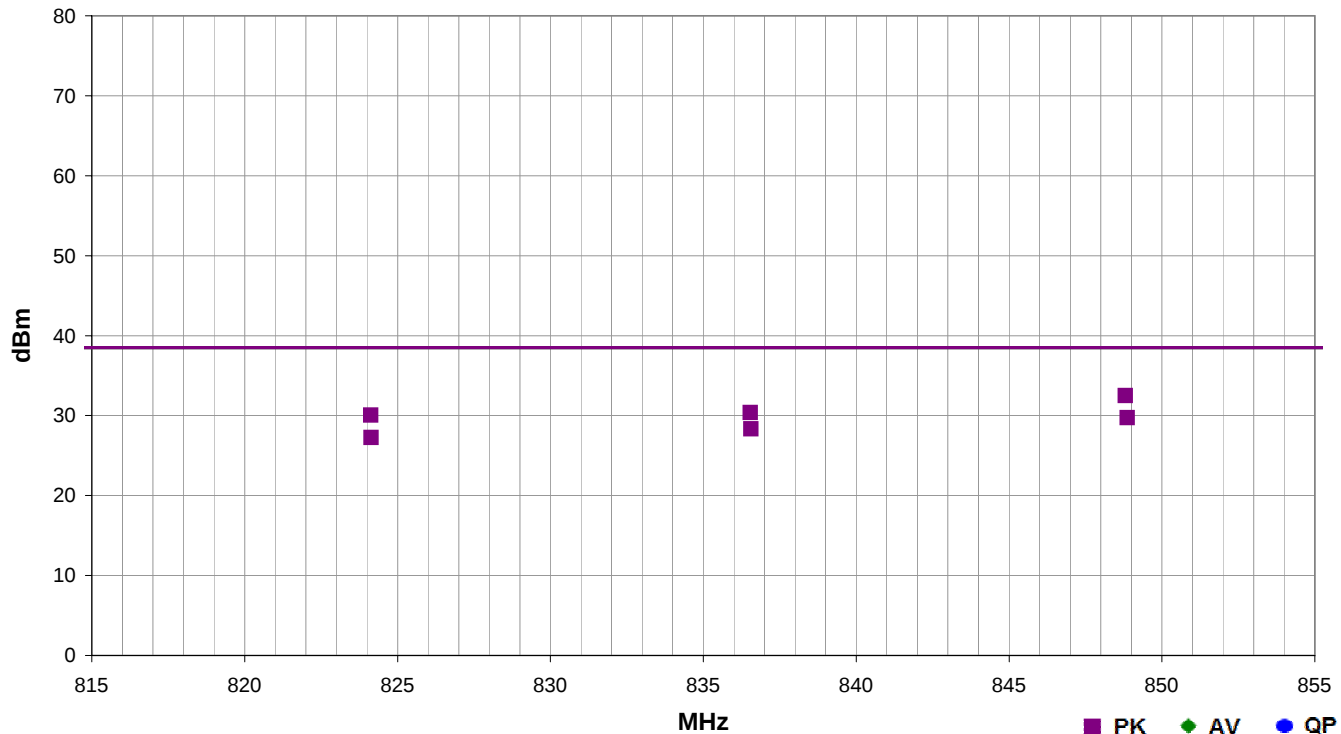
EFFECTIVE RADIATED POWER (ERP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/25/13		
Project:	None	Temperature:	22.5 °C		
Job Site:	EV01	Humidity:	30% RH		
Serial Number:	40000000046	Barometric Pres.:	1013 mbar	Tested by:	Carl Engholm, Rod Peloquin
EUT:	V3R				
Configuration:	1				
Customer:	Zonar Systems, LLC				
Attendees:	None				
EUT Power:	13.8 VDC				
Operating Mode:	Transmitting Cell Band (GSM850), GPRS, CS-4				
Deviations:	None				
Comments:	See comments below for channel, frequency, and EUT orientation.				

Test Specifications	Test Method
FCC 22H:2013	ANSI/TIA/EIA-603-C-2004

Run #	1	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
848.802	1.0	103.0	Horz	PK	1.78E+00	32.5	38.5	-6.0	High CH 251 (848.8 MHz), EUT Horizontal
836.537	1.0	280.0	Horz	PK	1.09E+00	30.4	38.5	-8.1	Mid CH 190 (836.6 MHz), EUT Horizontal
824.130	1.0	95.0	Horz	PK	1.02E+00	30.1	38.5	-8.4	Low CH 128 (824.2 MHz), EUT Horizontal
848.863	1.6	250.0	Vert	PK	9.44E-01	29.8	38.5	-8.8	High CH 251 (848.8 MHz), EUT Horizontal
836.560	1.0	116.0	Vert	PK	6.81E-01	28.3	38.5	-10.2	Mid CH 190 (836.6 MHz), EUT Horizontal
824.137	1.0	109.0	Vert	PK	5.31E-01	27.3	38.5	-11.2	Low CH 128 (824.2 MHz), EUT Horizontal



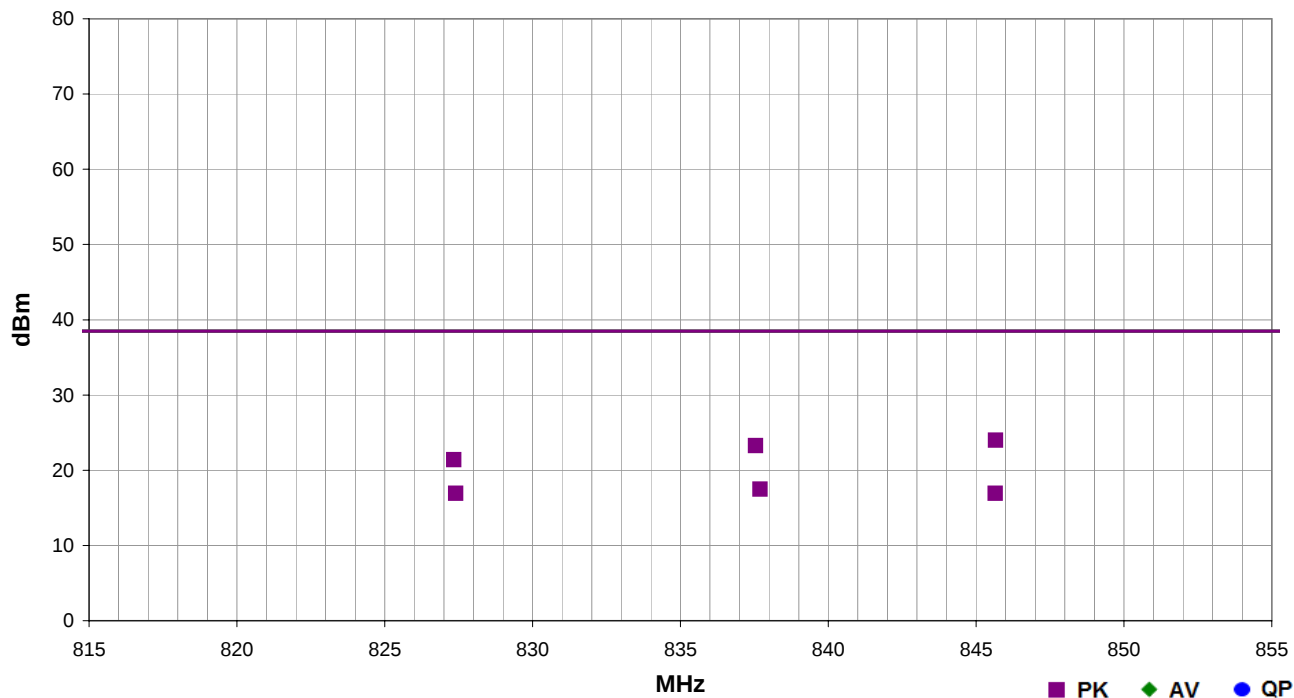
EFFECTIVE RADIATED POWER (ERP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/26/13	<i>Rod Pelouin</i>
Project:	None	Temperature:	22.4 °C	
Job Site:	EV01	Humidity:	34% RH	
Serial Number:	40000000046	Barometric Pres.:	1017 mbar	
EUT:	V3R			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting Cell (Band V), WCDMA Rel 99, All up bits			
Deviations:	None			
Comments:	See comments below for channel, frequency, and EUT orientation.			

Test Specifications	Test Method
FCC 22H:2013	ANSI/TIA/EIA-603-C-2004

Run #	3	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	845.660	1.0	97.0	Horz	PK	2.51E-01	24.0	38.5	-14.5	High CH 4233 (846.6 MHz), EUT Horizontal
	837.540	1.1	95.0	Horz	PK	2.11E-01	23.3	38.5	-15.2	Mid CH 4183 (836.6 MHz), EUT Horizontal
	827.340	1.1	92.0	Horz	PK	1.37E-01	21.4	38.5	-17.1	Low CH 4132 (826.4 MHz), EUT Horizontal
	837.693	1.0	116.0	Vert	PK	5.60E-02	17.5	38.5	-21.0	Mid CH 4183 (836.6 MHz), EUT Horizontal
	845.653	1.0	117.0	Vert	PK	4.93E-02	16.9	38.5	-21.6	High CH 4233 (846.6 MHz), EUT Horizontal
	827.407	1.0	117.0	Vert	PK	4.92E-02	16.9	38.5	-21.6	Low CH 4132 (826.4 MHz), EUT Horizontal



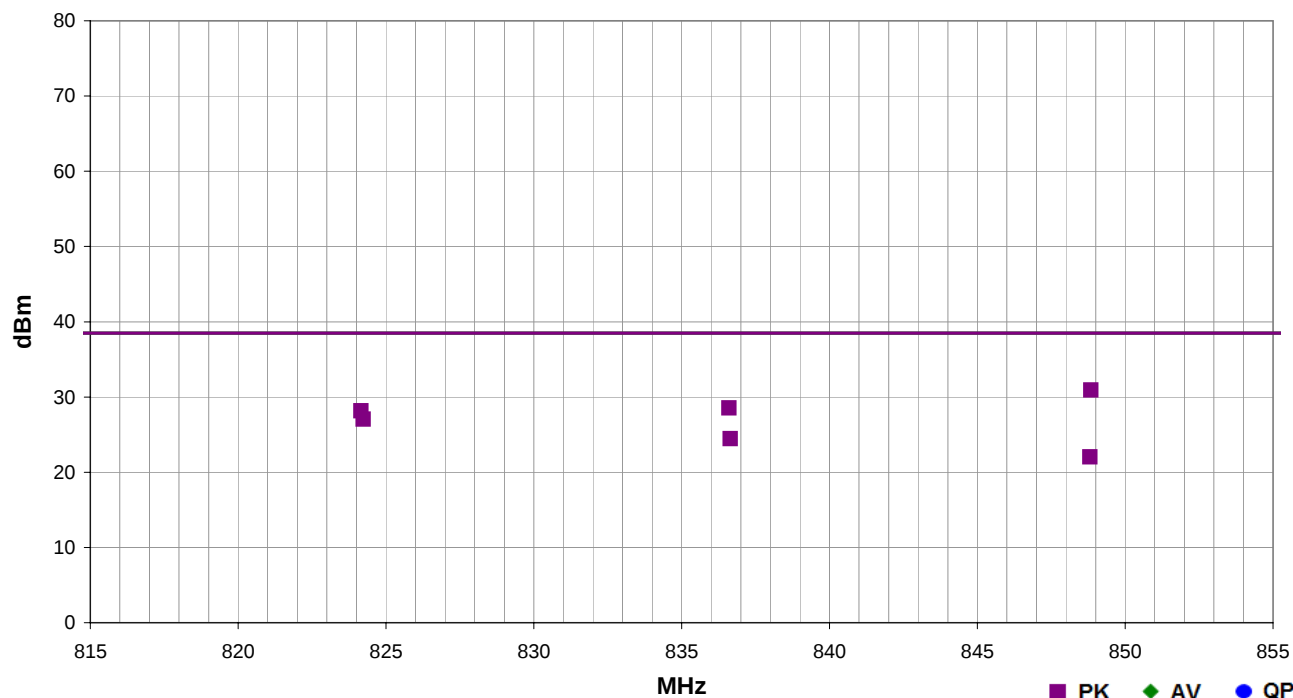
EFFECTIVE RADIATED POWER (ERP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/28/13	
Project:	None	Temperature:	22.9 °C	
Job Site:	EV01	Humidity:	40% RH	
Serial Number:	40000000046	Barometric Pres.:	1017 mbar	
EUT:	V3R			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting Cell Band (GSM850), EGPRS, MCS-9			
Deviations:	None			
Comments:	See comments below for channel, frequency, and EUT orientation.			

Test Specifications	Test Method
FCC 22H:2013	ANSI/TIA/EIA-603-C-2004

Run #	22	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
848.840	1.0	91.0	Horz	PK	1.23E+00	30.9	38.5	-7.6	High CH 251 (848.8 MHz), EUT Horizontal
836.605	1.0	89.0	Horz	PK	7.16E-01	28.6	38.5	-10.0	Mid CH 190 (836.6 MHz), EUT Horizontal
824.160	1.0	88.0	Horz	PK	6.56E-01	28.2	38.5	-10.3	Low CH 128 (824.2 MHz), EUT Horizontal
824.235	1.0	231.0	Vert	PK	5.08E-01	27.1	38.5	-11.4	Low CH 128 (824.2 MHz), EUT Horizontal
836.640	1.0	228.0	Vert	PK	2.79E-01	24.5	38.5	-14.0	Mid CH 190 (836.6 MHz), EUT Horizontal
848.810	1.0	127.0	Vert	PK	1.59E-01	22.0	38.5	-16.5	High CH 251 (848.8 MHz), EUT Horizontal

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting PCS Band, GPRS, CS-4

Transmitting PCS Band, EGPRS, MCS-9

Transmitting PCS (Band II), WCDMA Rel 99, All up bits

POWER SETTINGS INVESTIGATED

13.8 VDC

CONFIGURATIONS INVESTIGATED

ZONA0046 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 1850 MHz

Stop Frequency 1910 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0 mo
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	3/25/2013	12 mo
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0 mo
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24 mo
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24 mo
Antenna, Horn	EMCO	3115	AHC	6/20/2012	24 mo
Antenna, Horn	EMCO	3115	AHE	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/27/2012	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2011	36 mo
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The fundamental emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization and manipulating the EUT antenna in 3 orthogonal planes. The antennas to be used with the EUT were tested. The EUT was transmitting while set at the lowest channel, a middle channel, and the highest channel available. The amplitude and frequency were noted. The EUT was then replaced with a horn antenna. A signal generator was connected to the horn antenna and its output was adjusted to match the level previously noted for each frequency. The output of the signal generator was recorded, and by factoring in the gain (dBi) of the horn antenna the effective radiated power for each emission was determined.



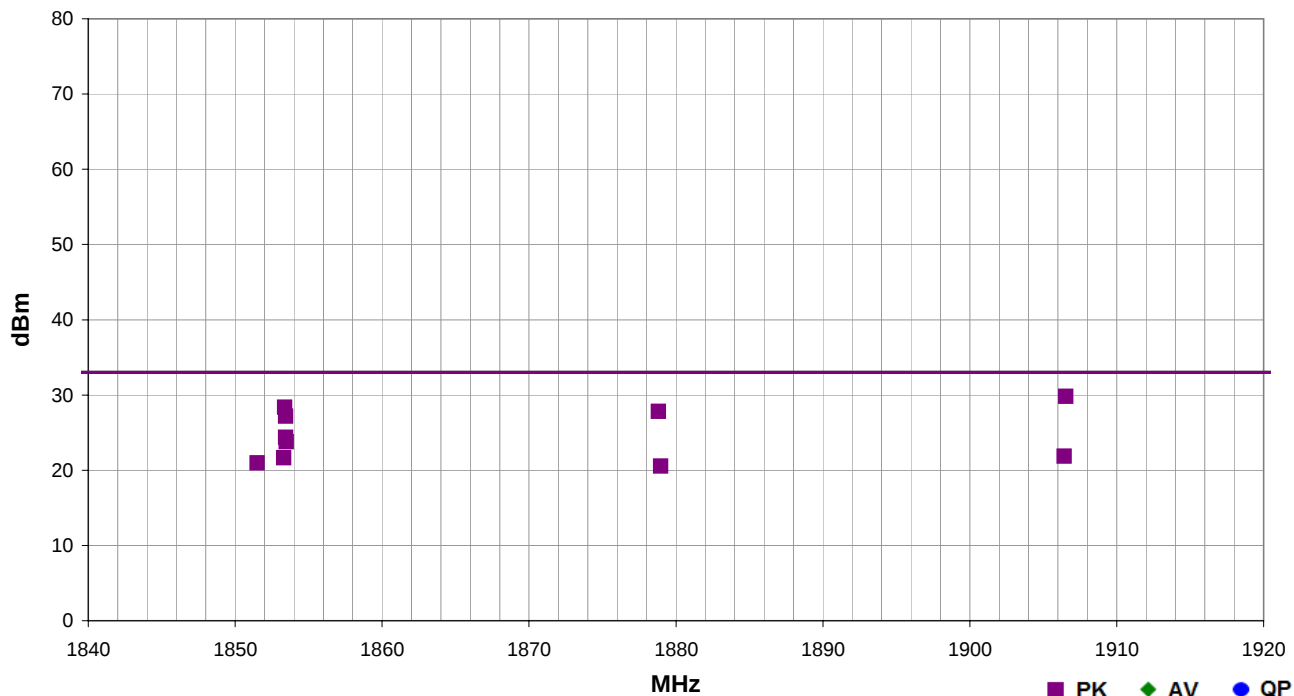
EFFECTIVE RADIATED POWER (EIRP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/27/13		
Project:	None	Temperature:	22.6 °C		
Job Site:	EV01	Humidity:	36% RH		
Serial Number:	40000000046	Barometric Pres.:	1014 mbar	Tested by:	Carl Engholm, Rod Peloquin
EUT:	V3R				
Configuration:	1				
Customer:	Zonar Systems, LLC				
Attendees:	None				
EUT Power:	13.8 VDC				
Operating Mode:	Transmitting PCS (Band II), WCDMA Rel 99, All up bits				
Deviations:	None				
Comments:	See comments below for channel, frequency, and EUT orientation.				

Test Specifications	Test Method
FCC 24E:2013	ANSI/TIA/EIA-603-C-2004

Run #	4	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1906.533	1.2	314.0	Horz	PK	9.62E-01	29.8	33.0	-3.2	High CH 9538 (1907.6 MHz), EUT Horizontal
1853.367	1.7	133.0	Horz	PK	6.85E-01	28.4	33.0	-4.6	Low CH 9262 (1852.4 MHz), EUT Horizontal
1878.820	1.1	333.0	Horz	PK	6.05E-01	27.8	33.0	-5.2	Mid CH 9400 (1880 MHz), EUT Horizontal
1853.447	1.2	235.0	Horz	PK	5.20E-01	27.2	33.0	-5.8	Low CH 9262 (1852.4 MHz), EUT On Side
1853.447	1.1	204.0	Vert	PK	2.72E-01	24.4	33.0	-8.6	Low CH 9262 (1852.4 MHz), EUT On Side
1853.473	1.1	73.0	Horz	PK	2.38E-01	23.8	33.0	-9.2	Low CH 9262 (1852.4 MHz), EUT On End
1906.433	1.0	171.0	Vert	PK	1.54E-01	21.9	33.0	-11.1	High CH 9538 (1907.6 MHz), EUT Horizontal
1853.307	1.0	223.0	Vert	PK	1.46E-01	21.7	33.0	-11.4	Low CH 9262 (1852.4 MHz), EUT On End
1851.493	1.0	177.0	Vert	PK	1.24E-01	21.0	33.0	-12.0	Low CH 9262 (1852.4 MHz), EUT Horizontal
1878.960	1.0	173.0	Vert	PK	1.14E-01	20.6	33.0	-12.4	Mid CH 9400 (1880 MHz), EUT Horizontal



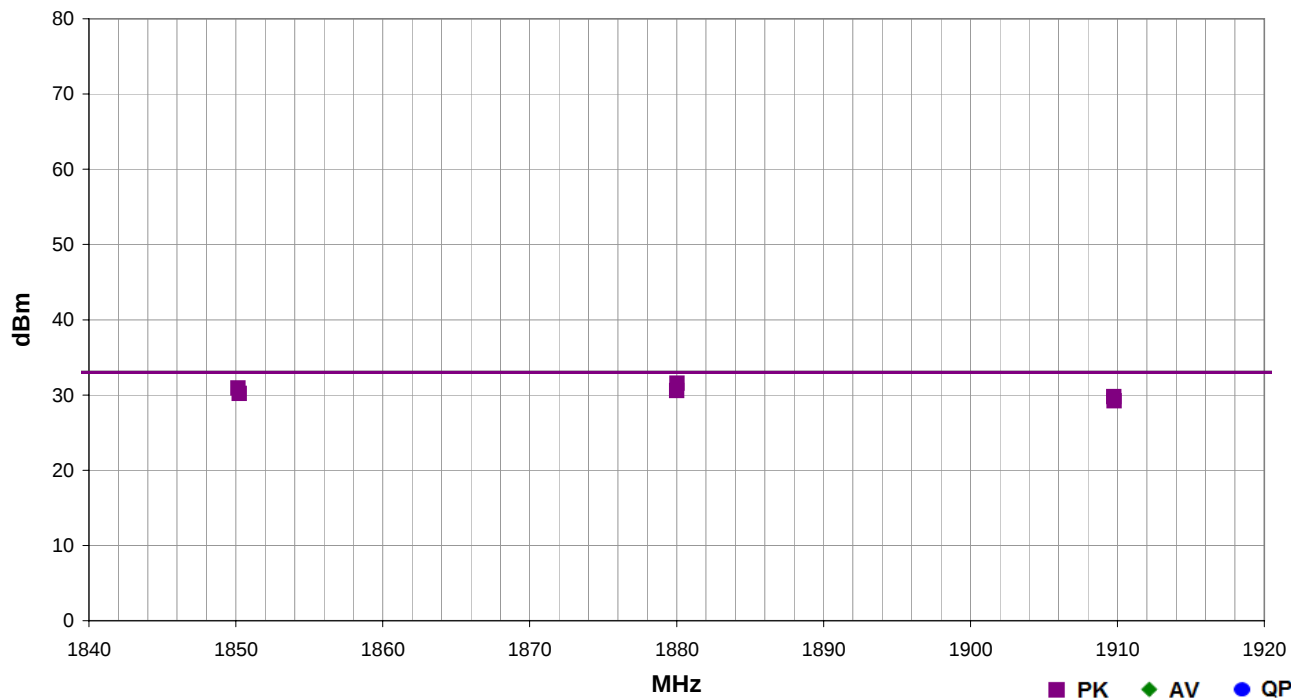
EFFECTIVE RADIATED POWER (EIRP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/28/13		
Project:	None	Temperature:	22.9 °C		
Job Site:	EV01	Humidity:	40% RH		
Serial Number:	40000000046	Barometric Pres.:	1017 mbar	Tested by:	Carl Engholm, Rod Peloquin
EUT:	V3R				
Configuration:	1				
Customer:	Zonar Systems, LLC				
Attendees:	None				
EUT Power:	13.8 VDC				
Operating Mode:	Transmitting PCS Band, EGPRS, MCS-9				
Deviations:	None				
Comments:	See comments below for channel, frequency, and EUT orientation.				

Test Specifications	Test Method
FCC 24E:2013	ANSI/TIA/EIA-603-C-2004

Run #	23	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1880.040	1.6	121.0	Horz	PK	1.43E+00	31.5	33.0	-1.5	Mid CH 661 (1880 MHz), EUT Horizontal
1850.160	1.0	204.0	Vert	PK	1.24E+00	30.9	33.0	-2.1	Low CH 512 (1850.2 MHz), EUT On Side
1880.000	1.0	205.0	Vert	PK	1.14E+00	30.6	33.0	-2.4	Mid CH 661 (1880 MHz), EUT On Side
1850.227	1.6	135.0	Horz	PK	1.05E+00	30.2	33.0	-2.8	Low CH 512 (1850.2 MHz), EUT Horizontal
1909.770	1.5	124.0	Horz	PK	9.51E-01	29.8	33.0	-3.2	High CH 810 (1909.8 MHz), EUT Horizontal
1909.775	1.0	206.0	Vert	PK	8.36E-01	29.2	33.0	-3.8	High CH 810 (1909.8 MHz), EUT On Side



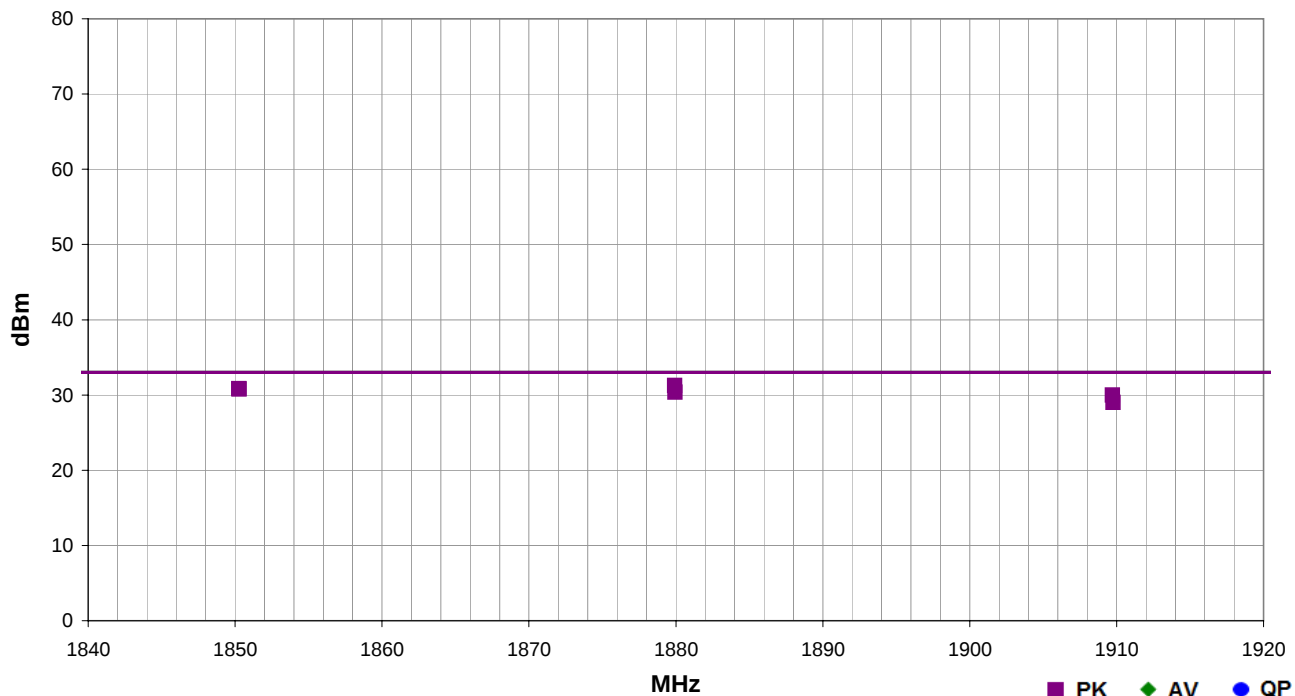
EFFECTIVE RADIATED POWER (EIRP)

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	03/28/13	<i>Roddy Le Pelouin</i>
Project:	None	Temperature:	22.9 °C	
Job Site:	EV01	Humidity:	40% RH	
Serial Number:	40000000046	Barometric Pres.:	1017 mbar	
EUT:	V3R			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting PCS Band, GPRS, CS-4			
Deviations:	None			
Comments:	See comments below for channel, frequency, and EUT orientation.			

Test Specifications	Test Method
FCC 24E:2013	ANSI/TIA/EIA-603-C-2004

Run #	24	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1879.920	1.2	131.0	Horz	PK	1.33E+00	31.2	33.0	-1.8	Mid CH 661 (1880 MHz), EUT Horizontal
1850.260	1.1	204.0	Vert	PK	1.21E+00	30.8	33.0	-2.2	Low CH 512 (1850.2 MHz), EUT On Side
1850.270	1.6	124.0	Horz	PK	1.20E+00	30.8	33.0	-2.2	Low CH 512 (1850.2 MHz), EUT Horizontal
1879.945	1.1	206.0	Vert	PK	1.09E+00	30.4	33.0	-2.6	Mid CH 661 (1880 MHz), EUT On Side
1909.720	1.2	134.0	Horz	PK	9.95E-01	30.0	33.0	-3.0	High CH 810 (1909.8 MHz), EUT Horizontal
1909.760	1.0	208.0	Vert	PK	7.98E-01	29.0	33.0	-4.0	High CH 810 (1909.8 MHz), EUT On Side



TRANSMITTER SPURIOUS EMISSIONS

PSA-ESCI 2012.12.14

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting Cell (Band V), WCDMA Rel 99, All up bits

Transmitting Cell Band (GSM850), GPRS, E-GPRS

POWER SETTINGS INVESTIGATED

13.8 VDC

CONFIGURATIONS INVESTIGATED

ZONA0046 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 18000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
.5-1 GHz Notch Filter	K&L Microwave	3TNF-500/1000-N/N	HFT	12/31/2012	24 mo
Attenuator, 'N'	Coaxicom	66702 5910-6	ATZ	3/20/2013	12 mo
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24 mo
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24 mo
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0 mo
Antenna, Dipole	ETS	3121C-DB4	ADH	NCR	36 mo
Antenna, Horn	EMCO	3115	AHE	NCR	0 mo
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/27/2013	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/27/2013	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/27/2013	12 mo
Antenna, Horn	ETS	3160-07	AHU	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/27/2012	12 mo
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/27/2012	12 mo
Antenna, Horn	ETS	3115	AlZ	1/24/2011	36 mo
EV01 Cables	N/A	Bilog Cables	EVA	6/26/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/26/2012	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The highest gain antenna to be used with the EUT was tested for final measurements. The EUT was configured for the lowest, a middle, and the highest transmit frequency in each operational band. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10:2009). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

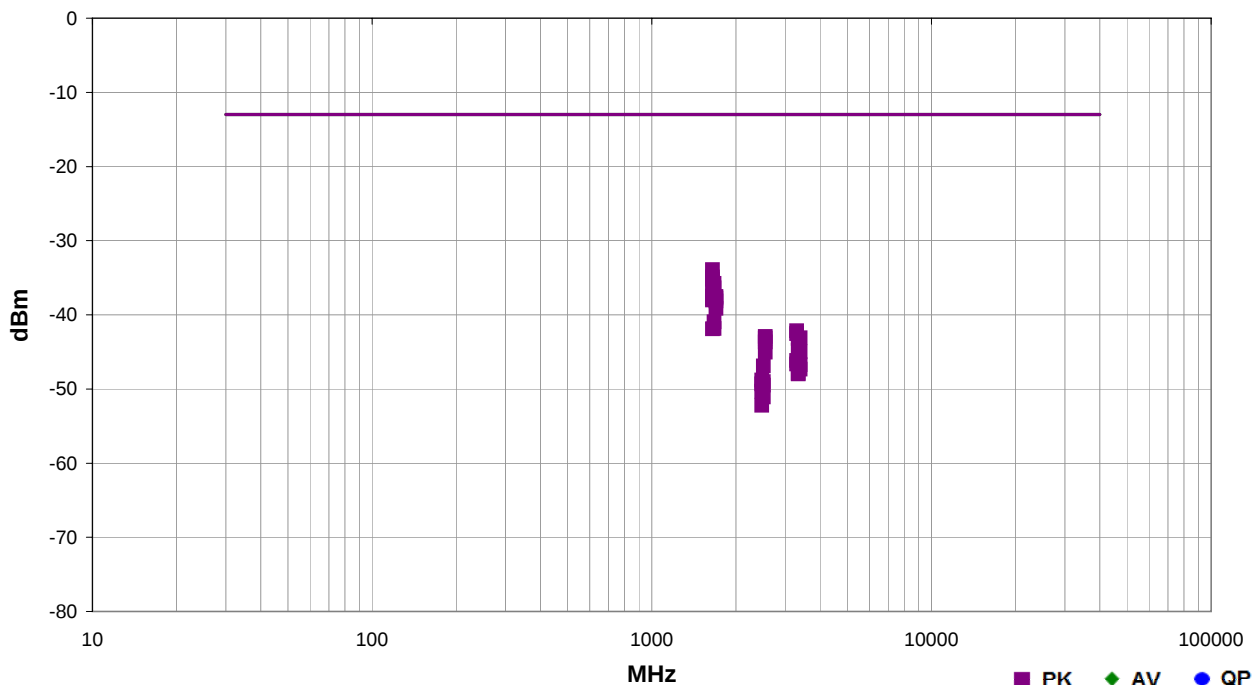
At an approved test site, the transmitter is placed on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole that is successively tuned to each of the highest spurious emissions for emissions below 1 GHz, and a horn antenna for emissions above 1 GHz. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

For the purposes of preliminary measurements, the field strength of the spurious emissions can be measured and compared with a 3 meter limit. The 3 meter limit was calculated to be 82.5 dBuV/m at 3 meters. The final measurements must be made utilizing the substitution method described above.

Work Order:	ZONA0046	Date:	03/30/13		
Project:	None	Temperature:	21.8 °C		
Job Site:	EV01	Humidity:	39.2% RH		
Serial Number:	40000000046	Barometric Pres.:	1021 mbar		
		Tested by:		Brandon Hobbs, Rod Peloquin	
EUT:	V3R				
Configuration:	1				
Customer:	Zonar Systems, LLC				
Attendees:	None				
EUT Power:	13.8 VDC				
Operating Mode:	Transmitting Cell Band (GSM850), GPRS, E-GPRS				
Deviations:	None				
Comments:	See comments below for channel, frequency, and EUT orientation.				

Test Specifications	Test Method
FCC 22H:2013	TIA/EIA-603-C:2004

Run #	1	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	1648.424	1.4	145.0	Horz	PK	4.08E-07	-33.9	-13.0	-20.9	E-GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	1648.310	1.0	165.0	Vert	PK	3.24E-07	-34.9	-13.0	-21.9	GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	1648.264	1.8	98.0	Vert	PK	3.02E-07	-35.2	-13.0	-22.2	GPRS, Low CH. 128 (824.2 MHz), EUT On End
	1673.320	1.0	140.0	Horz	PK	2.65E-07	-35.8	-13.0	-22.8	GPRS, Mid CH. 190 (836.6 MHz), EUT Horizontal
	1648.304	1.3	194.0	Vert	PK	2.57E-07	-35.9	-13.0	-22.9	E-GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	1673.273	1.0	160.0	Horz	PK	2.31E-07	-36.4	-13.0	-23.4	E-GPRS, Mid CH. 190 (848.8 MHz), EUT Horizontal
	1648.410	1.3	257.0	Vert	PK	1.78E-07	-37.5	-13.0	-24.5	GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	1697.700	1.0	331.0	Vert	PK	1.76E-07	-37.5	-13.0	-24.5	GPRS, High CH. 251 (848.8 MHz), EUT On Side
	1697.593	1.0	334.0	Vert	PK	1.68E-07	-37.7	-13.0	-24.7	E-GPRS, High CH. 251 (848.8 MHz), EUT On Side
	1648.377	1.4	297.0	Horz	PK	1.66E-07	-37.8	-13.0	-24.8	GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	1648.324	1.7	246.0	Horz	PK	1.59E-07	-38.0	-13.0	-25.0	GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	1697.440	1.0	148.0	Horz	PK	1.53E-07	-38.1	-13.0	-25.1	E-GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	1697.460	1.0	150.0	Horz	PK	1.22E-07	-39.1	-13.0	-26.1	GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	1673.420	1.0	75.0	Vert	PK	8.00E-08	-41.0	-13.0	-28.0	GPRS, Mid CH. 190 (848.8 MHz), EUT On Side
	1673.240	1.0	19.0	Vert	PK	6.50E-08	-41.9	-13.0	-28.9	E-GPRS, Mid CH. 190 (848.8 MHz), EUT On Side

	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	1648.370	1.0	175.0	Horz	PK	6.46E-08	-41.9	-13.0	-28.9	GPRS, Low CH. 128 (824.2 MHz), EUT On End
	3296.413	1.3	122.0	Vert	PK	6.08E-08	-42.2	-13.0	-29.2	GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	3296.533	1.4	126.0	Vert	PK	5.54E-08	-42.6	-13.0	-29.6	E-GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	2546.693	1.4	161.0	Horz	PK	5.07E-08	-42.9	-13.0	-29.9	GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	3395.307	1.5	134.0	Vert	PK	4.87E-08	-43.1	-13.0	-30.1	GPRS, High CH. 251 (848.8 MHz), EUT On Side
	2546.573	1.0	201.0	Vert	PK	4.84E-08	-43.1	-13.0	-30.1	E-GPRS, High CH. 251 (848.8 MHz), EUT On Side
	3346.560	1.3	105.0	Vert	PK	4.80E-08	-43.2	-13.0	-30.2	E-GPRS, Mid CH. 190 (848.8 MHz), EUT On Side
	2546.587	1.0	203.0	Vert	PK	4.32E-08	-43.6	-13.0	-30.6	GPRS, High CH. 251 (848.8 MHz), EUT On Side
	3346.567	1.1	151.0	Vert	PK	3.32E-08	-44.8	-13.0	-31.8	GPRS, Mid CH. 190 (848.8 MHz), EUT On Side
	3394.867	1.7	140.0	Vert	PK	3.14E-08	-45.0	-13.0	-32.0	E-GPRS, High CH. 251 (848.8 MHz), EUT On Side
	2546.433	1.6	37.0	Horz	PK	3.13E-08	-45.0	-13.0	-32.0	E-GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	3296.780	1.0	41.0	Horz	PK	2.42E-08	-46.2	-13.0	-33.2	E-GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	3297.193	1.0	31.0	Horz	PK	2.16E-08	-46.7	-13.0	-33.7	GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	3395.080	1.0	42.0	Horz	PK	2.13E-08	-46.7	-13.0	-33.7	E-GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	2509.633	1.0	321.0	Vert	PK	2.04E-08	-46.9	-13.0	-33.9	E-GPRS, Mid CH. 190 (848.8 MHz), EUT On Side
	3395.393	1.0	32.0	Horz	PK	1.85E-08	-47.3	-13.0	-34.3	GPRS, High CH. 251 (848.8 MHz), EUT Horizontal
	3346.327	1.0	34.0	Horz	PK	1.63E-08	-47.9	-13.0	-34.9	GPRS, Mid CH. 190 (836.6 MHz), EUT Horizontal
	3346.460	1.0	43.0	Horz	PK	1.59E-08	-48.0	-13.0	-35.0	E-GPRS, Mid CH. 190 (848.8 MHz), EUT Horizontal
	2472.560	1.2	111.0	Vert	PK	1.31E-08	-48.8	-13.0	-35.8	GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	2509.727	1.6	135.0	Horz	PK	1.26E-08	-49.0	-13.0	-36.0	E-GPRS, Mid CH. 190 (848.8 MHz), EUT Horizontal
	2472.480	1.0	113.0	Vert	PK	1.17E-08	-49.3	-13.0	-36.3	E-GPRS, Low CH. 128 (824.2 MHz), EUT On Side
	2509.707	1.1	2.0	Horz	PK	1.12E-08	-49.5	-13.0	-36.5	GPRS, Mid CH. 190 (836.6 MHz), EUT Horizontal
	2472.820	1.1	6.0	Horz	PK	9.31E-09	-50.3	-13.0	-37.3	E-GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal
	2510.040	1.9	303.0	Vert	PK	7.75E-09	-51.1	-13.0	-38.1	GPRS, Mid CH. 190 (848.8 MHz), EUT On Side
	2472.560	2.6	162.0	Horz	PK	6.01E-09	-52.2	-13.0	-39.2	GPRS, Low CH. 128 (824.2 MHz), EUT Horizontal



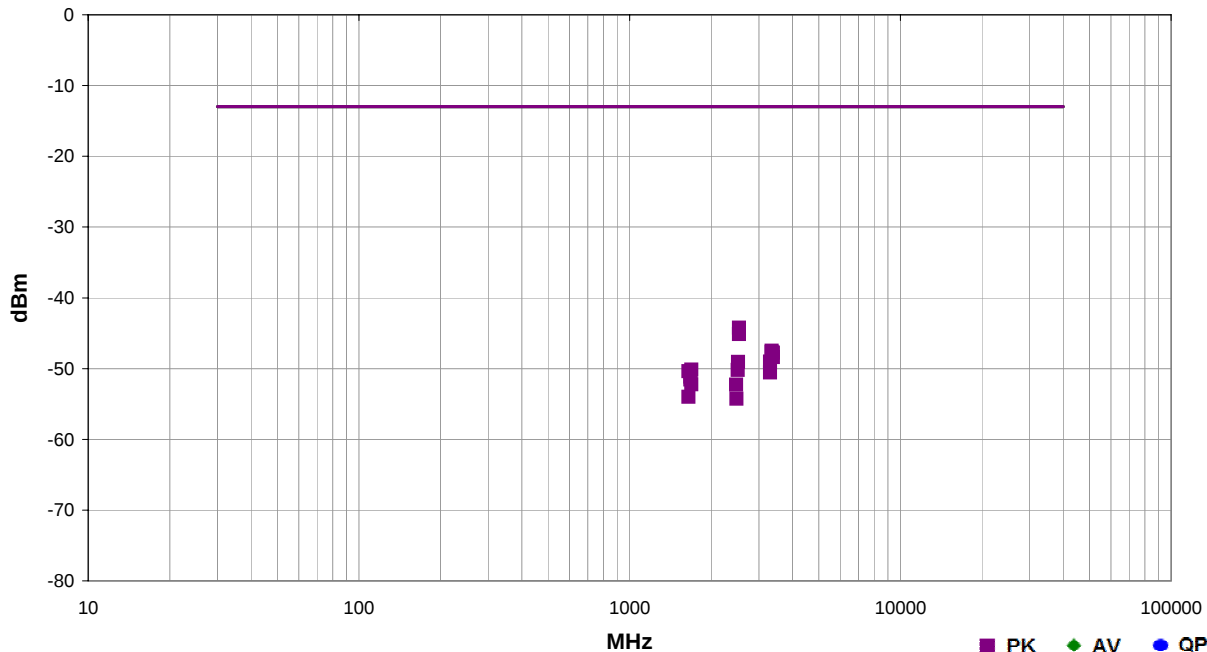
TRANSMITTER SPURIOUS EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	04/01/13	<i>Rocky Le Pellego</i>
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	40% RH	
Serial Number:	40000000046	Barometric Pres.:	1019 mbar	
EUT:		V3R		
Configuration:		1		
Customer:		Zonar Systems, LLC		
Attendees:		None		
EUT Power:		13.8 VDC		
Operating Mode:		Transmitting Cell (Band V), WCDMA Rel 99, All up bits		
Deviations:		None		
Comments:		See comments below for channel, frequency, and EUT orientation.		

Test Specifications	Test Method
FCC 22H:2013	ANSI/TIA/EIA-603-C-2004

Run #	70	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2536.350	1.0	212.0	Vert	PK	3.76E-08	-44.2	-13.0	-31.2	High CH 4233 (846.6 MHz), EUT On Side
2536.467	1.1	110.0	Horz	PK	3.06E-08	-45.1	-13.0	-32.1	High CH 4233 (846.6 MHz), EUT Horizontal
3350.750	1.0	21.0	Horz	PK	1.79E-08	-47.5	-13.0	-34.5	Mid CH 4183 (836.6 MHz), EUT Horizontal
3351.167	1.1	31.0	Vert	PK	1.71E-08	-47.7	-13.0	-34.7	Mid CH 4183 (836.6 MHz), EUT On Side
3381.933	1.0	313.0	Horz	PK	1.67E-08	-47.8	-13.0	-34.8	High CH 4233 (846.6 MHz), EUT Horizontal
3382.267	1.5	308.0	Vert	PK	1.46E-08	-48.4	-13.0	-35.4	High CH 4233 (846.6 MHz), EUT On Side
3301.627	1.0	12.0	Horz	PK	1.25E-08	-49.0	-13.0	-36.0	Low CH 4132 (826.4 MHz), EUT Horizontal
2512.733	1.3	219.0	Vert	PK	1.24E-08	-49.1	-13.0	-36.1	Mid CH 4183 (836.6 MHz), EUT On Side
1691.400	1.0	136.0	Horz	PK	9.66E-09	-50.1	-13.0	-37.1	High CH 4233 (846.6 MHz), EUT Horizontal
2512.417	1.0	204.0	Horz	PK	9.58E-09	-50.2	-13.0	-37.2	Mid CH 4183 (836.6 MHz), EUT Horizontal
1650.787	1.0	129.0	Horz	PK	9.14E-09	-50.4	-13.0	-37.4	Low CH 4132 (826.4 MHz), EUT Horizontal
3301.333	1.0	164.0	Vert	PK	8.82E-09	-50.5	-13.0	-37.5	Low CH 4132 (826.4 MHz), EUT On Side
1675.300	1.0	127.0	Horz	PK	7.65E-09	-51.2	-13.0	-38.2	Mid CH 4183 (836.6 MHz), EUT Horizontal
1674.983	1.1	73.0	Vert	PK	6.97E-09	-51.6	-13.0	-38.6	Mid CH 4183 (836.6 MHz), EUT On Side
1690.783	1.0	91.0	Vert	PK	5.96E-09	-52.2	-13.0	-39.2	High CH 4233 (846.6 MHz), EUT On Side
2476.150	1.0	277.0	Vert	PK	5.89E-09	-52.3	-13.0	-39.3	Low CH 4132 (826.4 MHz), EUT On Side
1651.100	1.0	65.0	Vert	PK	3.99E-09	-54.0	-13.0	-41.0	Low CH 4132 (826.4 MHz), EUT On Side
2479.147	1.0	3.0	Horz	PK	3.73E-09	-54.3	-13.0	-41.3	Low CH 4132 (826.4 MHz), EUT Horizontal



TRANSMITTER SPURIOUS EMISSIONS

PSA-ESCI 2012.12.14

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting PCS Band, GPRS (CS-4), EGPRS (MCS-9)
Transmitting PCS (Band II), WCDMA Rel 99, All up bits

POWER SETTINGS INVESTIGATED

13.8 VDC

CONFIGURATIONS INVESTIGATED

ZONA0046 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 26500 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0 mo
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24 mo
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24 mo
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	9/11/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	9/11/2012	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/27/2013	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/27/2013	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/27/2013	12 mo
Antenna, Horn	ETS	3160-07	AHU	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/27/2012	12 mo
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/27/2012	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2011	36 mo
Antenna, Horn	EMCO	3115	AHC	6/20/2012	24 mo
Antenna, Horn	EMCO	3115	AHC	NCR	0 mo
1-2 GHz Notch Filter	K&L Microwave	3TNF-1000/2000-N/N	HFU	12/31/20112	24 mo
EV01 Cables	N/A	Bilog Cables	EVA	6/26/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/26/2012	12 mo
Antenna, Biconilog	EMCO	3141	AXG	4/10/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The highest gain antenna to be used with the EUT was tested for final measurements. The EUT was configured for the lowest, a middle, and the highest transmit frequency in each operational band. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10:2009). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

At an approved test site, the transmitter is placed on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole that is successively tuned to each of the highest spurious emissions for emissions below 1 GHz, and a horn antenna for emissions above 1 GHz. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

For the purposes of preliminary measurements, the field strength of the spurious emissions can be measured and compared with a 3 meter limit. The 3 meter limit was calculated to be 82.5 dBuV/m at 3 meters. The final measurements must be made utilizing the substitution method described above.



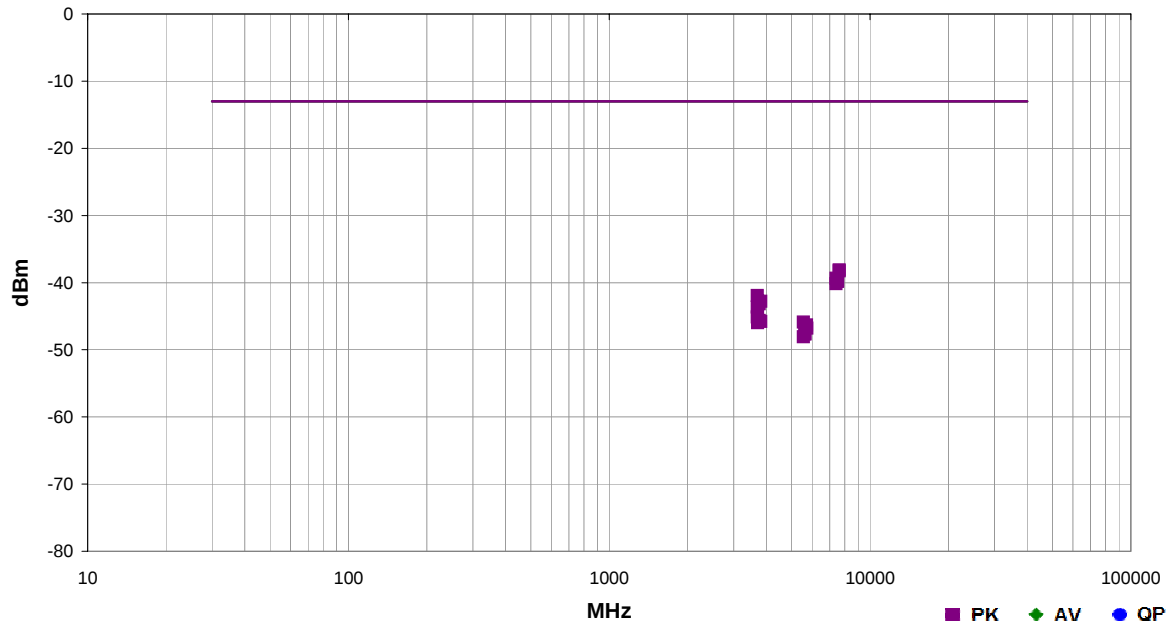
TRANSMITTER SPURIOUS EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	04/01/13	
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	40% RH	
Serial Number:	40000000046	Barometric Pres.:	1019 mbar	
EUT:	V3R			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting PCS (Band II), WCDMA Rel 99, All up bits			
Deviations:	None			
Comments:	See comments below for channel, frequency, and EUT orientation.			

Test Specifications	Test Method
FCC 24E:2013	ANSI/TIA/EIA-603-C-2004

Run #	71	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
7633.083	1.0	257.0	Vert	PK	1.53E-07	-38.1	-13.0	-25.1	High CH 9538 (1907.6 MHz), EUT On Side
7629.100	1.0	84.0	Horz	PK	1.50E-07	-38.2	-13.0	-25.2	High CH 9538 (1907.6 MHz), EUT On Side
7413.817	1.2	233.0	Vert	PK	1.16E-07	-39.4	-13.0	-26.4	Low CH 9262 (1852.4 MHz), EUT On Side
7515.983	1.0	203.0	Vert	PK	1.09E-07	-39.6	-13.0	-26.6	Mid CH 9400 (1880 MHz), EUT On Side
7521.500	1.0	146.0	Horz	PK	1.04E-07	-39.8	-13.0	-26.8	Mid CH 9400 (1880 MHz), EUT On Side
7412.383	1.0	127.0	Horz	PK	9.64E-08	-40.2	-13.0	-27.2	Low CH 9262 (1852.4 MHz), EUT On Side
3702.567	1.0	277.0	Vert	PK	6.42E-08	-41.9	-13.0	-28.9	Low CH 9262 (1852.4 MHz), EUT On Side
3706.883	1.1	174.0	Horz	PK	5.38E-08	-42.7	-13.0	-29.7	Low CH 9262 (1852.4 MHz), EUT On Side
3817.383	1.4	258.0	Vert	PK	5.28E-08	-42.8	-13.0	-29.8	High CH 9538 (1907.6 MHz), EUT On Side
3757.983	1.2	184.0	Horz	PK	4.84E-08	-43.2	-13.0	-30.2	Mid CH 9400 (1880 MHz), EUT On Side
3702.867	1.0	21.0	Vert	PK	4.34E-08	-43.6	-13.0	-30.6	Low CH 9262 (1852.4 MHz), EUT On End
3706.867	1.0	181.0	Vert	PK	3.32E-08	-44.8	-13.0	-31.8	Low CH 9262 (1852.4 MHz), EUT Horizontal
3702.500	1.0	193.0	Horz	PK	3.07E-08	-45.1	-13.0	-32.1	Low CH 9262 (1852.4 MHz), EUT On End
3758.050	1.0	8.0	Vert	PK	2.72E-08	-45.7	-13.0	-32.7	Mid CH 9400 (1880 MHz), EUT On Side
3817.350	1.0	270.0	Horz	PK	2.65E-08	-45.8	-13.0	-32.8	High CH 9538 (1907.6 MHz), EUT On Side
5555.833	1.0	329.0	Horz	PK	2.57E-08	-45.9	-13.0	-32.9	Low CH 9262 (1852.4 MHz), EUT On Side
3706.450	1.0	235.0	Horz	PK	2.52E-08	-46.0	-13.0	-33.0	Low CH 9262 (1852.4 MHz), EUT Horizontal
5723.217	1.0	103.0	Vert	PK	2.33E-08	-46.3	-13.0	-33.3	High CH 9538 (1907.6 MHz), EUT On Side
5727.150	1.0	43.0	Horz	PK	2.09E-08	-46.8	-13.0	-33.8	High CH 9538 (1907.6 MHz), EUT On Side
5638.383	1.0	328.0	Horz	PK	1.73E-08	-47.6	-13.0	-34.6	Mid CH 9400 (1880 MHz), EUT On Side
5635.417	1.0	292.0	Vert	PK	1.72E-08	-47.6	-13.0	-34.6	Mid CH 9400 (1880 MHz), EUT On Side
5560.583	1.0	115.0	Vert	PK	1.56E-08	-48.1	-13.0	-35.1	Low CH 9262 (1852.4 MHz), EUT On Side



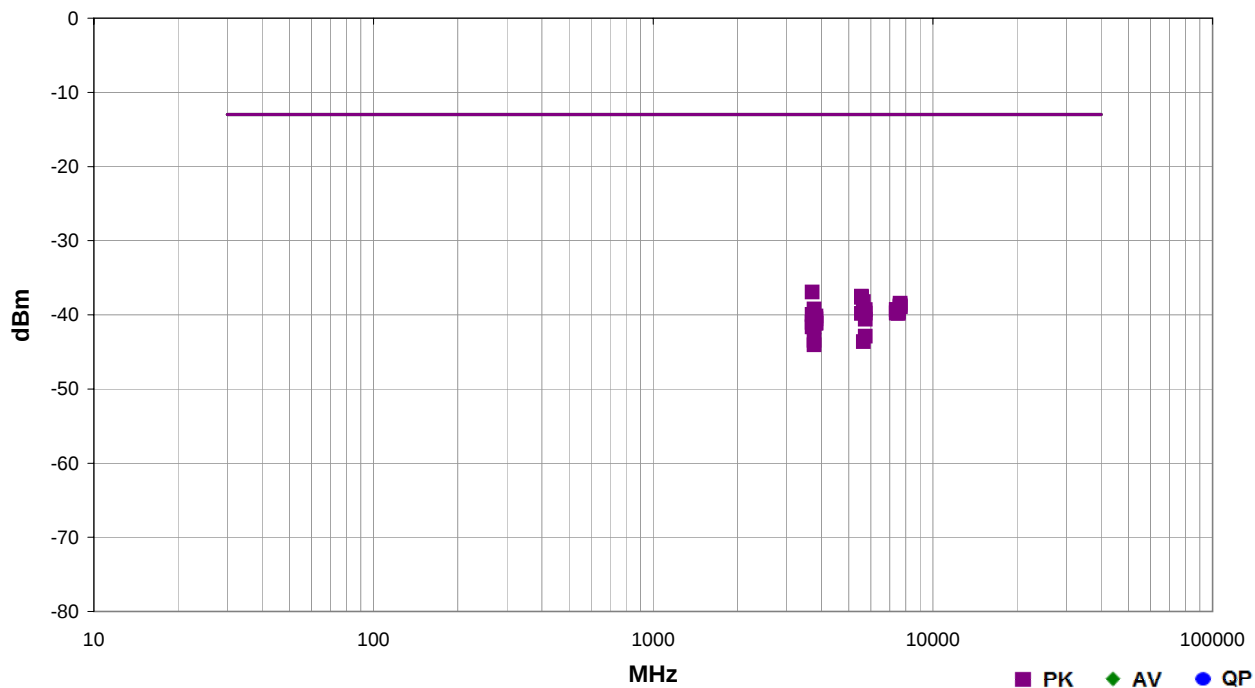
TRANSMITTER SPURIOUS EMISSIONS

PSA-ESCI 2012.12.14
PSA-ESCI Version 2013.1.31

Work Order:	ZONA0046	Date:	04/01/13	
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	40% RH	
Serial Number:	40000000046	Barometric Pres.:	1019 mbar	
		Tested by:	Carl Engholm, Rod Peloquin	
EUT:	V3R			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting PCS Band, GPRS (CS-4), EGPRS (MCS-9)			
Deviations:	None			
Comments:	See comments below for modulation technology, channel, frequency, and EUT orientation.			

Test Specifications	Test Method
FCC 24E:2013	ANSI/TIA/EIA-603-C-2004

Run #	72	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
3700.320	1.4	100.0	Vert	PK	2.02E-07	-36.9	-13.0	-23.9	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
5550.520	1.4	65.0	Horz	PK	1.77E-07	-37.5	-13.0	-24.5	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
5550.760	1.0	84.0	Vert	PK	1.73E-07	-37.6	-13.0	-24.6	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
5550.607	1.4	68.0	Horz	PK	1.73E-07	-37.6	-13.0	-24.6	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
5639.973	1.2	81.0	Vert	PK	1.50E-07	-38.2	-13.0	-25.2	GPRS, Mid CH 661 (1880 MHz), EUT On Side
7640.713	1.0	69.0	Horz	PK	1.44E-07	-38.4	-13.0	-25.4	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
7640.607	1.0	41.0	Horz	PK	1.34E-07	-38.7	-13.0	-25.7	GPRS, High CH 810 (1909.8 MHz), EUT On Side
7640.507	1.0	11.0	Vert	PK	1.28E-07	-38.9	-13.0	-25.9	GPRS, High CH 810 (1909.8 MHz), EUT On Side
7639.080	1.7	305.0	Vert	PK	1.28E-07	-38.9	-13.0	-25.9	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
3760.067	1.4	116.0	Vert	PK	1.19E-07	-39.2	-13.0	-26.2	GPRS, Mid CH 661 (1880 MHz), EUT On Side
5729.467	1.6	85.0	Vert	PK	1.18E-07	-39.3	-13.0	-26.3	GPRS, High CH 810 (1909.8 MHz), EUT On Side
7399.073	1.0	145.0	Horz	PK	1.17E-07	-39.3	-13.0	-26.3	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
7398.840	1.0	41.0	Vert	PK	1.17E-07	-39.3	-13.0	-26.3	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
5640.053	1.2	41.0	Horz	PK	1.14E-07	-39.4	-13.0	-26.4	EGPRS, Mid CH 661 (1880 MHz), EUT On Side
7519.447	1.0	316.0	Vert	PK	1.11E-07	-39.5	-13.0	-26.5	EGPRS, Mid CH 661 (1880 MHz), EUT On Side

	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	5639.973	1.1	26.0	Horz	PK	1.09E-07	-39.6	-13.0	-26.6	GPRS, Mid CH 661 (1880 MHz), EUT On Side
	7519.033	1.0	126.0	Horz	PK	1.09E-07	-39.6	-13.0	-26.6	EGPRS, Mid CH 661 (1880 MHz), EUT On Side
	7518.367	1.0	66.0	Vert	PK	1.09E-07	-39.6	-13.0	-26.6	GPRS, Mid CH 661 (1880 MHz), EUT On Side
	7401.120	1.0	263.0	Horz	PK	1.07E-07	-39.7	-13.0	-26.7	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
	5729.360	1.2	82.0	Vert	PK	1.05E-07	-39.8	-13.0	-26.8	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
	7399.293	1.1	193.0	Vert	PK	1.05E-07	-39.8	-13.0	-26.8	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
	5550.367	1.0	255.0	Vert	PK	1.04E-07	-39.8	-13.0	-26.8	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
	7519.953	1.0	287.0	Horz	PK	1.04E-07	-39.8	-13.0	-26.8	GPRS, Mid CH 661 (1880 MHz), EUT On Side
	3700.440	1.0	104.0	Vert	PK	1.01E-07	-39.9	-13.0	-26.9	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
	3819.627	1.0	207.0	Vert	PK	9.64E-08	-40.2	-13.0	-27.2	GPRS, High CH 810 (1909.8 MHz), EUT On Side
	3819.780	1.1	162.0	Horz	PK	8.79E-08	-40.6	-13.0	-27.6	GPRS, High CH 810 (1909.8 MHz), EUT On Side
	5729.367	1.3	17.0	Horz	PK	8.72E-08	-40.6	-13.0	-27.6	GPRS, High CH 810 (1909.8 MHz), EUT On Side
	3700.473	1.3	161.0	Horz	PK	7.86E-08	-41.0	-13.0	-28.0	EGPRS, Low CH 512 (1850.2 MHz), EUT On Side
	3819.567	1.0	161.0	Horz	PK	7.83E-08	-41.1	-13.0	-28.1	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
	3819.580	1.1	286.0	Vert	PK	7.66E-08	-41.2	-13.0	-28.2	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
	3759.980	1.1	176.0	Horz	PK	6.86E-08	-41.6	-13.0	-28.6	GPRS, Mid CH 661 (1880 MHz), EUT On Side
	3700.500	1.1	164.0	Horz	PK	6.85E-08	-41.6	-13.0	-28.6	GPRS, Low CH 512 (1850.2 MHz), EUT On Side
	5729.313	1.3	158.0	Horz	PK	5.13E-08	-42.9	-13.0	-29.9	EGPRS, High CH 810 (1909.8 MHz), EUT On Side
	3760.093	1.0	198.0	Vert	PK	4.53E-08	-43.4	-13.0	-30.4	EGPRS, Mid CH 661 (1880 MHz), EUT On Side
	5640.267	1.0	233.0	Vert	PK	4.34E-08	-43.6	-13.0	-30.6	EGPRS, Mid CH 661 (1880 MHz), EUT On Side
	3759.907	1.0	98.0	Horz	PK	3.94E-08	-44.0	-13.0	-31.0	EGPRS, Mid CH 661 (1880 MHz), EUT On Side

Receiver Spurious Emissions

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Receiving GPRS, cell mid channel.

POWER SETTINGS INVESTIGATED

12 VDC

CONFIGURATIONS INVESTIGATED

ZONA0044 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Signal Generator	Agilent	E8257D	TGU	2/1/2012	36 mo
Antenna, Horn	ETS	3117	AHQ	9/12/2012	36 mo
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	BSW	NCR	0 mo
OC07 Cables	ESM Cable Corp.	8-18GHz cables	OCY	3/7/2012	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVL	1/18/2013	12 mo
Antenna, Horn	ETS	3160-07	AHX	NCR	0 mo
OC07 Cables	ESM Cable Corp.	1-8GHz cables	OCX	3/7/2012	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVJ	1/18/2013	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIR	5/26/2011	24 mo
OC07 Cables	ESM Cable Corp.	30-1GHz cables	OCW	3/7/2012	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOM	1/18/2013	12 mo
Antenna, Biconilog	EMCO	3142	AXA	1/11/2013	12 mo
Spectrum Analyzer	Agilent	E4440A	AFA	6/15/2012	24 mo

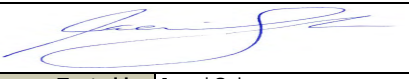
MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

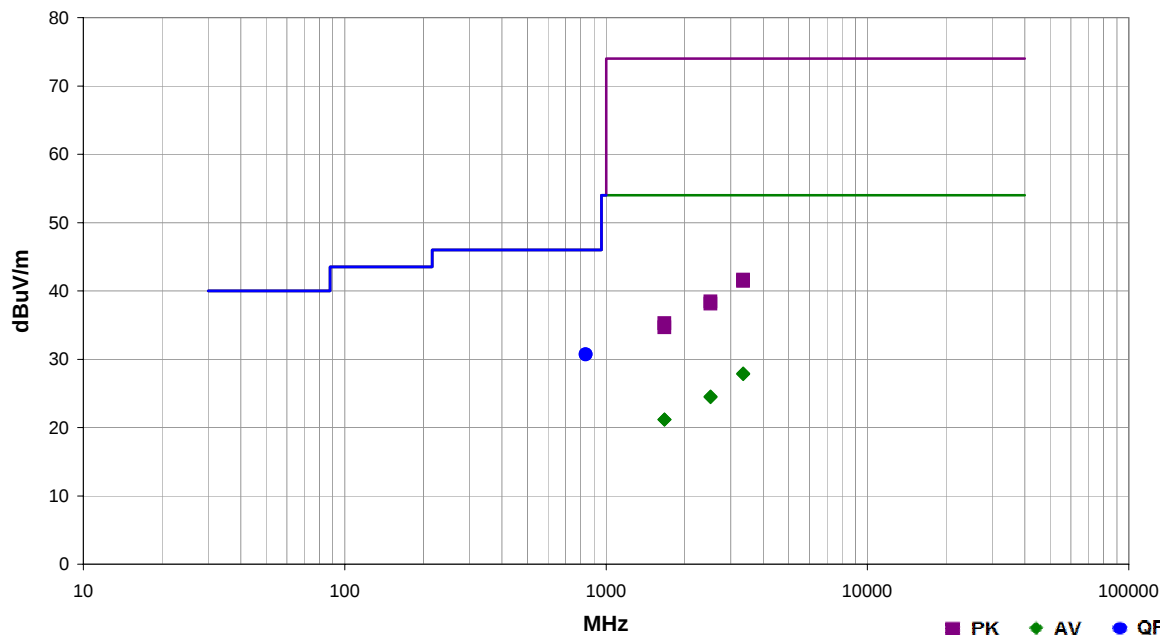
The fundamental emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization and manipulating the EUT antenna in 3 orthogonal planes. The antennas to be used with the EUT were tested. The EUT was transmitting while set at the lowest channel, a middle channel, and the highest channel available. The amplitude and frequency were noted. The EUT was then replaced with a horn antenna. A signal generator was connected to the horn antenna and its output was adjusted to match the level previously noted for each frequency. The output of the signal generator was recorded, and by factoring in the gain (dBi) of the horn antenna the effective radiated power for each emission was determined.

Receiver Spurious Emissions

Work Order:	ZONA0044	Date:	02/22/13	
Project:	None	Temperature:	20.2 C	
Job Site:	OC07	Humidity:	36.0% RH	
Serial Number:	None	Barometric Pres.:	1016 mbar	
EUT:	V3R	Tested by:	Jaemi Suh	
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	12 VDC			
Operating Mode:	Receiving GPRS, cell mid channel.			
Deviations:	None			
Comments:	EUT Z-Axis			

Test Specifications	Class B	Test Method
FCC 15.109:2013		ANSI C63.10:2009

Run #	2	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
836.126	14.7	16.0	1.0	289.0	3.0	0.0	Vert	QP	0.0	30.7	46.0	-15.3	GPRS, Ch. 190, EUT Z-Axis
835.616	14.7	16.0	3.4	193.0	3.0	0.0	Horz	QP	0.0	30.7	46.0	-15.3	GPRS, Ch. 190, EUT Z-Axis
3346.000	27.1	0.8	1.0	88.0	3.0	0.0	Vert	AV	0.0	27.9	54.0	-26.1	GPRS, Ch. 190, EUT Z-Axis
3346.280	27.0	0.8	2.7	356.0	3.0	0.0	Horz	AV	0.0	27.8	54.0	-26.2	GPRS, Ch. 190, EUT Z-Axis
2508.500	29.2	-4.7	3.4	168.0	3.0	0.0	Horz	AV	0.0	24.5	54.0	-29.5	GPRS, Ch. 190, EUT Z-Axis
2508.693	29.1	-4.7	1.0	241.0	3.0	0.0	Vert	AV	0.0	24.4	54.0	-29.6	GPRS, Ch. 190, EUT Z-Axis
3347.700	40.8	0.8	2.6	356.0	3.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	GPRS, Ch. 190, EUT Z-Axis
3348.427	40.6	0.8	1.0	88.0	3.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	GPRS, Ch. 190, EUT Z-Axis
1672.987	28.6	-7.4	1.0	70.0	3.0	0.0	Vert	AV	0.0	21.2	54.0	-32.8	GPRS, Ch. 190, EUT Z-Axis
1672.367	28.6	-7.4	1.9	30.0	3.0	0.0	Horz	AV	0.0	21.2	54.0	-32.8	GPRS, Ch. 190, EUT Z-Axis
2507.647	43.1	-4.7	1.0	241.0	3.0	0.0	Vert	PK	0.0	38.4	74.0	-35.6	GPRS, Ch. 190, EUT Z-Axis
2508.960	42.8	-4.7	3.1	168.0	3.0	0.0	Horz	PK	0.0	38.1	74.0	-35.9	GPRS, Ch. 190, EUT Z-Axis
1671.280	42.7	-7.4	1.9	30.0	3.0	0.0	Horz	PK	0.0	35.3	74.0	-38.7	GPRS, Ch. 190, EUT Z-Axis
1672.247	42.1	-7.4	1.0	70.0	3.0	0.0	Vert	PK	0.0	34.7	74.0	-39.3	GPRS, Ch. 190, EUT Z-Axis