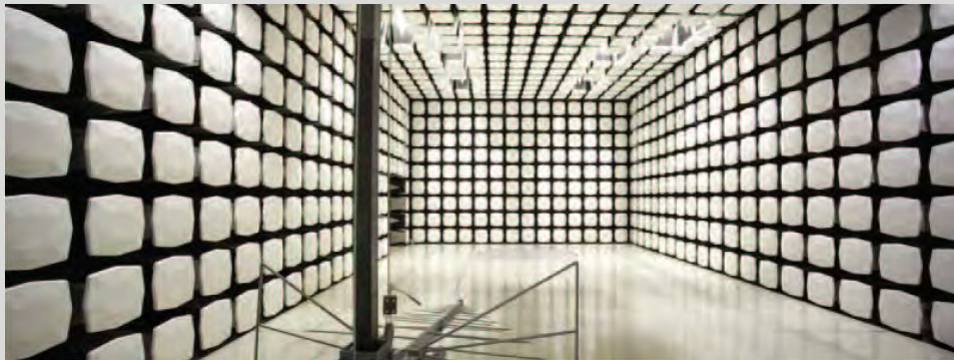




## Zonar Systems, LLC

V3

Report #: ZONA0036



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – [www.nwemc.com](http://www.nwemc.com)

California – Minnesota – Oregon – New York – Washington



22975 NW Evergreen Parkway  
Suite 400  
Hillsboro, Oregon 97124

**Certificate of Test**  
Last Date of Test: May 01, 2012  
Zonar Systems, LLC  
Model: V3

**Emissions**

Test Description	Specification	Test Method	Pass/Fail
Effective Radiated Power (ERP)	FCC 22H:2012	ANSI/TIA/EIA-603-C-2004	Pass
Effective Radiated Power (EIRP)	FCC 24E:2012	ANSI/TIA/EIA-603-C-2004	Pass
Transmitter Spurious Emissions	FCC 22H:2012	ANSI/TIA/EIA-603-C-2004	Pass
Transmitter Spurious Emissions	FCC 24E:2012	ANSI/TIA/EIA-603-C-2004	Pass
Receiver Spurious Emissions	FCC 15.109:2012 Class B	ANSI C63.4:2009	Pass

**Deviations From Test Standards**

None

Approved By:

Don Fecteau, IS Manager



NVLAP Lab Code: 200630-0

**Test Facility**

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

Northwest EMC, Inc.  
22975 NW Evergreen Parkway, Suite 400  
Hillsboro, OR 97124

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 #2834D-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		

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## 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. The scope includes radio, ITE, and medical standards from around the world. See: <http://www.nwemc.com/accreditations/>

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## Canada

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

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## 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.

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## Australia/New Zealand

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

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## Korea

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

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## Japan

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

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## 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.

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## Singapore

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

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## Hong Kong

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

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## Vietnam

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

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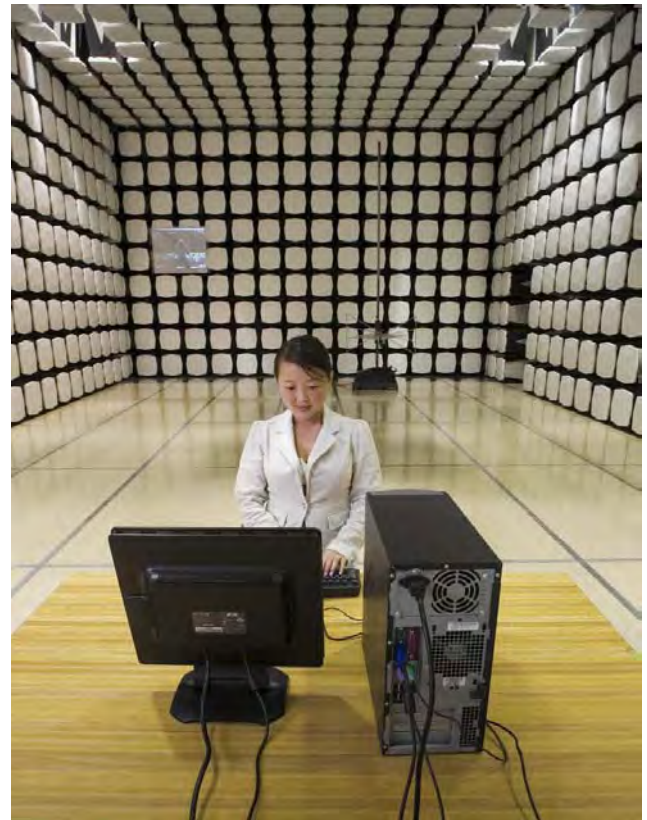
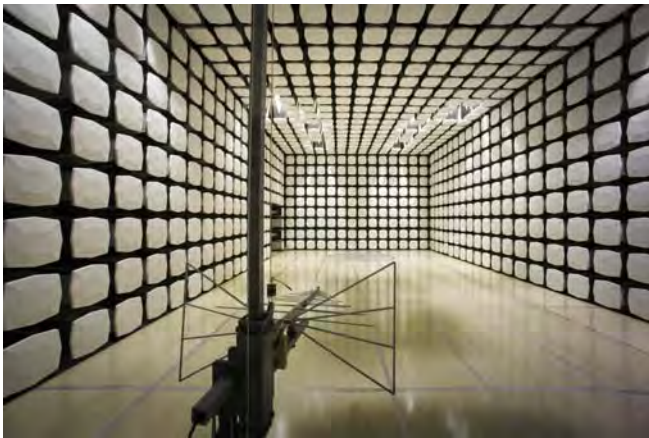
## Russia

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

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<b>Oregon</b> Labs EV01-EV12 22975 NW Evergreen Pkwy, #400 Hillsboro, OR 97124 (503) 844-4066	<b>California</b> Labs OC01-OC13 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>New York</b> Labs WA01-WA04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	<b>Minnesota</b> Labs MN01-MN08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	<b>Washington</b> Labs SU01-SU07 14128 339 <sup>th</sup> Ave. SE Sultan, WA 98294 (360) 793-8675
<b>VCCI</b>				
C-1071, R-1025, G-84, C-2687, T-1658, R-2318	R-1943, G-85, C-2766, T-1659, G-548		R-3125, G-86, G-141, C-3464, T-1634	R-871, G-83, C-3265, T-1511
<b>Industry Canada</b>				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1





## Product Description

### Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	Zonar Systems, LLC
<b>Address:</b>	18200 Cascade Ave. S Suite, 200
<b>City, State, Zip:</b>	Seattle, WA 98188
<b>Test Requested By:</b>	David Pascoe
<b>Model:</b>	V3
<b>First Date of Test:</b>	April 20, 2012
<b>Last Date of Test:</b>	May 01, 2012
<b>Receipt Date of Samples:</b>	April 20, 2012
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

### Information Provided by the Party Requesting the Test

#### Functional Description of the EUT (Equipment Under Test):

Vehicle mounted equipment that contains a cellular modem.

#### Testing Objective:

To demonstrate compliance to FCC Part 22H and 24E for radiated output power and spurious radiated emissions.

**Configuration 1 ZONA0036**

<b>EUT</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
Vehicle based GSM/UMTS module	Zonar Systems, LLC	V3	4000000045

<b>Remote Equipment Outside of Test Setup Boundary</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
Linear DC lab supply	None	None	None

<b>Cables</b>					
<b>Cable Type</b>	<b>Shield</b>	<b>Length (m)</b>	<b>Ferrite</b>	<b>Connection 1</b>	<b>Connection 2</b>
DC Power	No	2.0m	No	Vehicle based GSM/UMTS module	Remote DC Supply
Serial 6 pin data	No	1.0m	No	Vehicle based GSM/UMTS module	Unterminated
Serial 8 pin data	No	1.0m	No	Vehicle based GSM/UMTS module	Unterminated

**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	4/20/2012	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.
2	4/25/2012	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.
3	5/1/2012	Transmitter 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.
4	5/1/2012	Receiver Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



## Effective Radiated Power (ERP)

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  
 Transmitting Cell Band, EGPRS (EDGE)  
 Transmitting Cell Band, GPRS (GMSK)

### POWER SETTINGS INVESTIGATED

13.8 VDC

### CONFIGURATIONS INVESTIGATED

ZONA0036 - 1

### FREQUENCY RANGE INVESTIGATED

Start Frequency	824 MHz	Stop Frequency	849 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
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0
Antenna, Dipole	ETS	3121C-DB4	ADH	NCR	36
Attenuator, 'N'	Coaxicom	66702 5910-6	ATZ	3/21/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Antenna, Biconilog	EMCO	3142	AXJ	5/17/2011	12
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12

### 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

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

### MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

### 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 1/2 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 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 4000000045	Date: 04/20/12
Customer: Zonar Systems, LLC	Temperature: 22
Attendees: David Pascoe	Humidity: 36%
Project: None	Barometric Pres.: 29.85
Tested by: Rod Peloquin	Power: 13.8 VDC
	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	<b>Test Method</b>
FCC 22H:2012	ANSI/TIA/EIA-603-C-2004

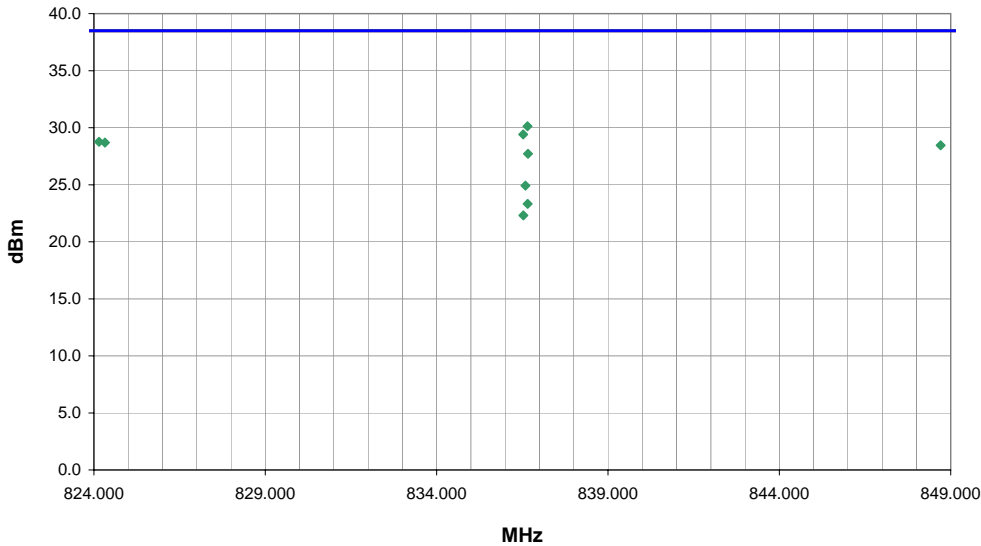
<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

<b>COMMENTS</b>
None

<b>EUT OPERATING MODES</b>
Transmitting Cell Band, GPRS (GMSK)

<b>DEVIATIONS FROM TEST STANDARD</b>
No deviations.

Run #	1	 Signature
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
836.650	215.0	1.3	V-Bilog	PK	1.03E+00	30.1	38.5	-8.4	Mid channel, EUT on side
849.050	210.0	1.3	V-Bilog	PK	9.75E-01	29.9	38.5	-8.6	High channel, EUT on side
836.525	22.0	1.0	H-Bilog	PK	8.73E-01	29.4	38.5	-9.1	Mid channel, EUT horizontal
824.150	207.0	1.3	V-Bilog	PK	7.52E-01	28.8	38.5	-9.7	Low channel, EUT on side
824.320	17.0	1.0	H-Bilog	PK	7.40E-01	28.7	38.5	-9.8	Low channel, EUT horizontal
848.705	190.0	1.0	H-Bilog	PK	7.01E-01	28.5	38.5	-10.0	High channel, EUT horizontal
836.665	16.0	1.0	H-Bilog	PK	5.89E-01	27.7	38.5	-10.8	Mid Channel, EUT on front
836.590	238.0	1.8	V-Bilog	PK	3.10E-01	24.9	38.5	-13.6	Mid Channel, EUT horizontal
836.655	81.0	1.4	V-Bilog	PK	2.15E-01	23.3	38.5	-15.2	Mid Channel, EUT on front
836.530	133.0	1.0	H-Bilog	PK	1.70E-01	22.3	38.5	-16.2	Mid Channel, EUT on side



# Effective Radiated Power (ERP)

PSA 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 400000045	Date: 04/23/12
Customer: Zonar Systems, LLC	Temperature: 23.4
Attendees: David Pascoe	Humidity: 47%
Project: None	Barometric Pres.: 29.97
Tested by: Carl Engholm	Power: 13.8 VDC
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 22H:2012	ANSI/TIA/EIA-603-C-2004

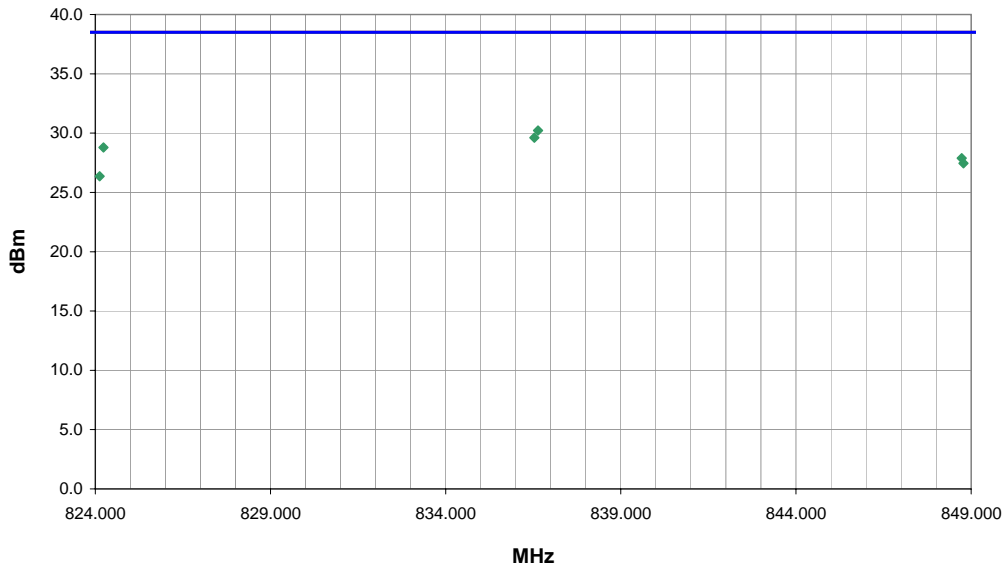
TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Transmitting Cell Band, EGPRS (EDGE)

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	2	<i>Signature</i> 
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
836.635	220.0	1.3	V-Bilog	PK	1.05E+00	30.2	38.5	-8.3	Mid channel, EUT on side
836.530	15.0	1.1	H-Bilog	PK	9.14E-01	29.6	38.5	-8.9	Mid channel, EUT horizontal
824.235	139.0	1.1	H-Bilog	PK	7.57E-01	28.8	38.5	-9.7	Low channel, EUT horizontal
848.730	211.0	1.3	V-Bilog	PK	6.15E-01	27.9	38.5	-10.6	High channel, EUT on side
848.780	138.0	1.0	H-Bilog	PK	5.57E-01	27.5	38.5	-11.0	High channel, EUT horizontal
824.125	222.0	1.3	V-Bilog	PK	4.33E-01	26.4	38.5	-12.1	Low channel, EUT on side



# Effective Radiated Power (ERP)

PSA 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 400000045	Date: 04/24/12
Customer: Zonar Systems, LLC	Temperature: 23.4
Attendees: None	Humidity: 47%
Project: None	Barometric Pres.: 29.97
Tested by: Carl Engholm	Power: 13.8 VDC
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 22H:2012	ANSI/TIA/EIA-603-C-2004

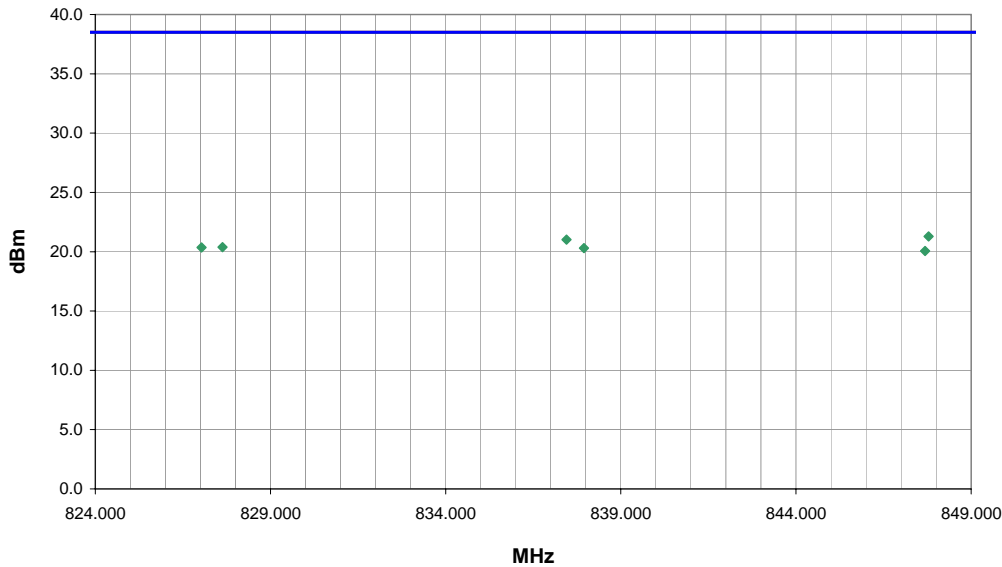
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3

**COMMENTS**  
None

**EUT OPERATING MODES**  
Transmitting Cell Band V, WCDMA Rel 99

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	3	<i>Signature</i> 
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
847.783	360.0	1.3	V-Bilog	PK	1.35E-01	21.3	38.5	-17.2	High channel, EUT on side
837.450	99.0	1.2	V-Bilog	PK	1.26E-01	21.0	38.5	-17.5	Mid channel, EUT on side
827.633	176.0	1.1	H-Bilog	PK	1.09E-01	20.4	38.5	-18.1	Low channel, EUT horizontal
827.033	348.0	1.4	V-Bilog	PK	1.09E-01	20.4	38.5	-18.1	Low channel, EUT on side
837.950	264.0	1.0	H-Bilog	PK	1.07E-01	20.3	38.5	-18.2	Mid channel, EUT horizontal
847.683	19.0	1.0	H-Bilog	PK	1.01E-01	20.1	38.5	-18.4	High channel, EUT horizontal

## Effective Radiated Power (EIRP)

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 (GMSK)

Transmitting PCS Band, EGPRS (EDGE)

Transmitting PCS, WCDMA Rel 99 Band 2

### POWER SETTINGS INVESTIGATED

13.8 VDC

### CONFIGURATIONS INVESTIGATED

ZONA0036 - 1

### FREQUENCY RANGE INVESTIGATED

Start Frequency	1850 MHz	Stop Frequency	1910 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
Wireless Communication Test Set	Agilent	E5515C	BSV	NCR	0
Antenna, Horn	ETS	3115	AIZ	1/24/2011	24
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/28/2011	12
Spectrum Analyzer	Agilent	E4446A	AAQ	2/7/2012	12
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/28/2011	12
Attenuator, 'N'	Coaxicom	66702 5910-6	ATZ	3/21/2012	12
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Antenna, Horn	EMCO	3115	AHE	NCR	0

### 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

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

### MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

### 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 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 400000045	Date: 04/25/12
Customer: Zonar Systems, LLC	Temperature: 23.7 C
Attendees: None	Humidity: 46%
Project: None	Barometric Pres.: 29.93 in.
Tested by: Carl Engholm	Power: 13.8 VDC
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 24E:2012	ANSI/TIA/EIA-603-C-2004

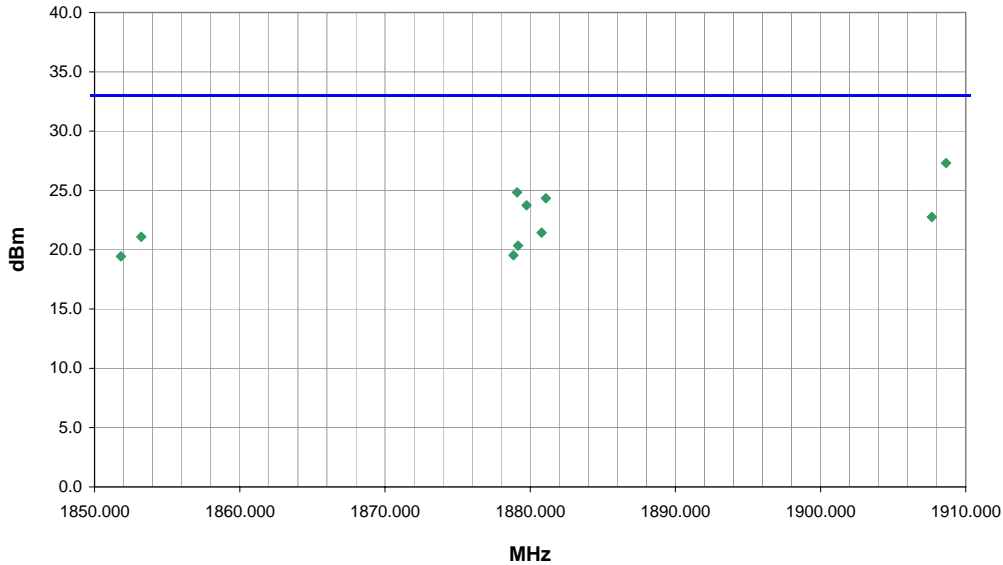
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3

COMMENTS
None

EUT OPERATING MODES
Transmitting PCS, WCDMA Rel 99 Band 2

DEVIATIONS FROM TEST STANDARD
No deviations.

Run #	5	
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1908.650	10.0	1.1	H-Horn	PK	5.38E-01	27.3	33.0	-5.7	High channel, EUT horizontal
1879.100	316.0	1.1	H-Horn	PK	3.05E-01	24.8	33.0	-8.2	Mid channel, EUT horizontal
1881.083	297.0	1.1	H-Horn	PK	2.72E-01	24.3	33.0	-8.7	Mid channel, EUT on end
1879.750	150.0	1.6	H-Horn	PK	2.37E-01	23.7	33.0	-9.3	Mid channel, EUT on side
1907.667	156.0	1.3	V-Horn	PK	1.89E-01	22.8	33.0	-10.2	High channel, EUT on side
1880.783	152.0	1.6	V-Horn	PK	1.39E-01	21.4	33.0	-11.6	Mid channel, EUT on side
1853.217	313.0	1.1	H-Horn	PK	1.28E-01	21.1	33.0	-11.9	Low channel, EUT horizontal
1879.167	5.0	1.4	V-Horn	PK	1.08E-01	20.3	33.0	-12.7	Mid channel, EUT horizontal
1878.850	124.0	1.4	V-Horn	PK	8.99E-02	19.5	33.0	-13.5	Mid channel, EUT on end
1851.817	313.0	1.0	V-Horn	PK	8.79E-02	19.4	33.0	-13.6	Low channel, EUT on side



# Effective Radiated Power (EIRP)

PSA 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 400000045	Date: 04/25/12
Customer: Zonar Systems, LLC	Temperature: 23.1 C
Attendees: None	Humidity: 46%
Project: None	Barometric Pres.: 29.76 in.
Tested by: Carl Engholm	Power: 13.8 VDC
	Job Site: EV01

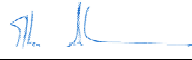
TEST SPECIFICATIONS	Test Method
FCC 24E:2012	ANSI/TIA/EIA-603-C-2004

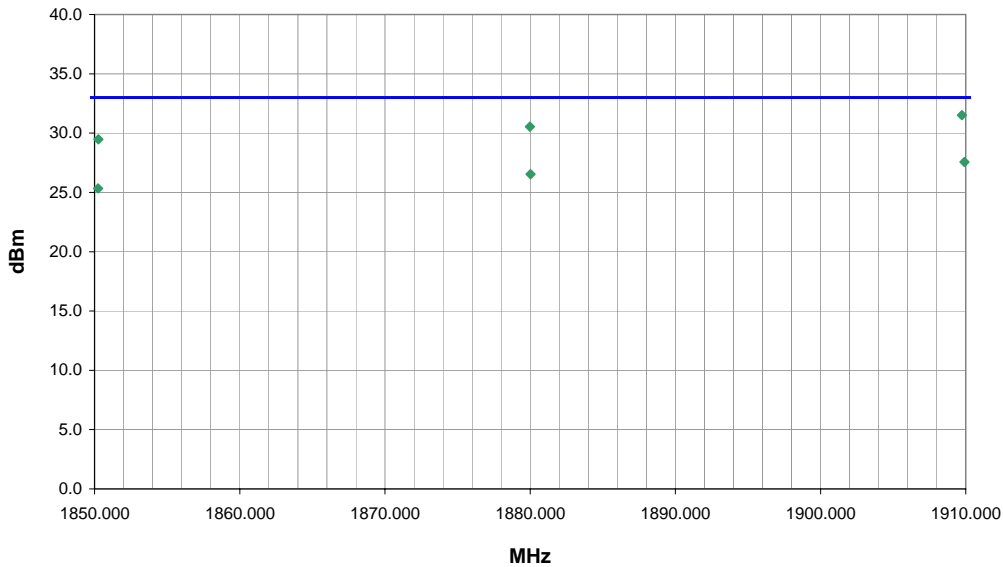
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3

COMMENTS
None

EUT OPERATING MODES
Transmitting PCS Band, EGPRS (EDGE)

DEVIATIONS FROM TEST STANDARD
No deviations.

Run #	6	<i>Signature</i> 
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1909.740	13.0	1.1	H-Horn	PK	1.42E+00	31.5	33.0	-1.5	High channel, EUT horizontal
1879.980	9.0	1.1	H-Horn	PK	1.13E+00	30.5	33.0	-2.5	Mid channel, EUT horizontal
1850.261	8.0	1.1	H-Horn	PK	8.87E-01	29.5	33.0	-3.5	Low channel, EUT horizontal
1909.910	313.0	1.2	V-Horn	PK	5.70E-01	27.6	33.0	-5.4	High channel, EUT on side
1880.030	333.0	1.0	V-Horn	PK	4.51E-01	26.5	33.0	-6.5	Mid channel, EUT on side
1850.241	313.0	1.0	V-Horn	PK	3.42E-01	25.3	33.0	-7.7	Low channel, EUT on side



# Effective Radiated Power (EIRP)

PSA 2012.04.05  
EMI 2008.1.9

EUT: V3	Work Order: ZONA0036
Serial Number: 400000045	Date: 04/25/12
Customer: Zonar Systems, LLC	Temperature: 23.4 C
Attendees: None	Humidity: 46%
Project: None	Barometric Pres.: 29.74 in.
Tested by: Carl Engholm	Power: 13.8 VDC
	Job Site: EV01

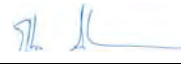
TEST SPECIFICATIONS	Test Method
FCC 24E:2012	ANSI/TIA/EIA-603-C-2004

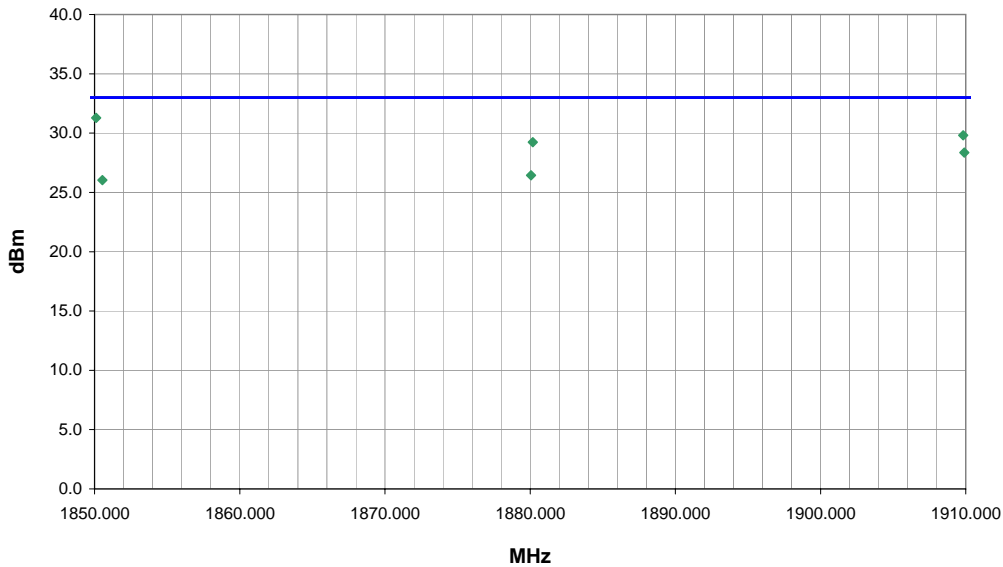
TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS
None

EUT OPERATING MODES
Transmitting PCS Band, GPRS (GMSK)

DEVIATIONS FROM TEST STANDARD
No deviations.

Run #	7	<i>Signature</i> 
Configuration #	1	
Results	Pass	



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1850.110	138.0	1.1	H-Horn	PK	1.34E+00	31.3	33.0	-1.7	Low channel, EUT horizontal
1909.820	138.0	1.0	H-Horn	PK	9.57E-01	29.8	33.0	-3.2	High channel, EUT horizontal
1880.180	140.0	1.0	H-Horn	PK	8.39E-01	29.2	33.0	-3.8	Mid channel, EUT horizontal
1909.900	150.0	1.3	V-Horn	PK	6.85E-01	28.4	33.0	-4.6	High channel, EUT on side
1880.060	334.0	1.0	V-Horn	PK	4.41E-01	26.4	33.0	-6.6	Mid channel, EUT on side
1850.535	312.0	1.0	V-Horn	PK	4.02E-01	26.0	33.0	-7.0	Low channel, EUT on side



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 WCDMA, cell channels 4132, 4182, and 4233.  
 Transmitting GPRS, and EGRPS cell channels 128,190,251.

## POWER SETTINGS INVESTIGATED

13.8 VDC

## CONFIGURATIONS INVESTIGATED

ZONA0036 - 1

## FREQUENCY RANGE INVESTIGATED

Start Frequency | 30 MHz | Stop Frequency | 10000 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
Antenna, Horn	ETS	3115	AJA	5/13/2011	24 mo
Universal Radio Communication	Rhode & Schwarz	CMU200	BSU	7/1/2011	NCR
.5-1 GHz Notch Filter	K&L Microwave	3TNF-500/1000-N/N	HGS	2/16/2012	24 mo
High Pass Filter	Micro-Tronics	HPM50108	HGP	7/9/2010	24 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/1/2011	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/1/2011	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn	MNI	10/18/2011	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	1/24/2012	12 mo
Antenna X-Wing Bilog 30MHZ-	Teseq	CBL 6141B	AYD	12/19/2011	12 mo
Spectrum Analyzer	Agilent	E4446A	AAT	3/2/2012	12 mo
Power Sensor	Agilent	N1913A	SQL	9/23/2010	24 mo
Power Meter	Agilent	N8481A	SQN	9/23/2010	24 mo
Signal Generator	Agilent	N5183A	TIA	1/27/2012	12 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

## MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

## 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.

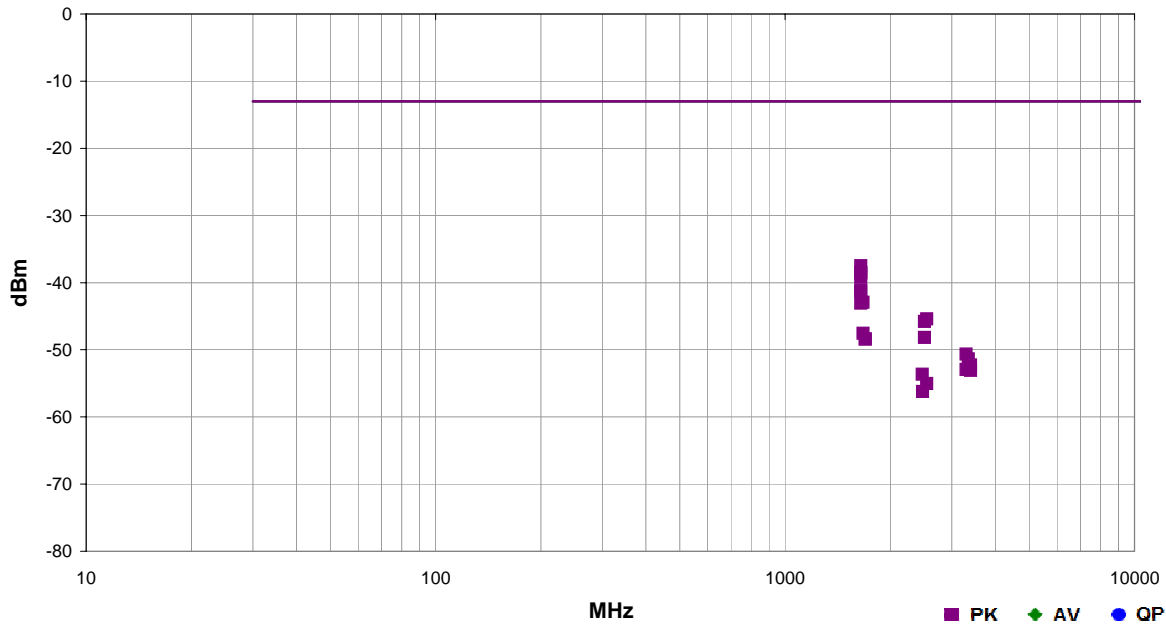
For the purposes of preliminary measurements, the field strength of the spurious emissions can be measured and compared with a 3 meter limit. The 3 meter limit was calculated to be 82.5 dBuV/m at 3 meters. The final measurements must be made utilizing the substitution method described above.

## Transmitter Spurious Emissions

Work Order:	ZONA0036	Date:	04/30/12	<i>Bryan Welles</i>
Project:	None	Temperature:	21.8 °C	
Job Site:	MN05	Humidity:	35.4% RH	
Serial Number:	4000000045	Barometric Pres.:	1014.3 mbar	
EUT:	V3			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting GPRS, and EGRPS cell channels 128,190,251.			
Deviations:	No deviations.			
Comments:	None			

<b>Test Specifications</b>	<b>Test Method</b>
FCC 22H:2012	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	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1648.292	2.2	155.0	Vert	PK	1.78E-07	-37.5	-13.0	-24.5	GPRS, Ch 128, EUT vertical
1648.267	1.0	210.0	Vert	PK	1.41E-07	-38.5	-13.0	-25.5	GPRS, Ch 128, EUT on side
1648.280	1.3	5.0	Horz	PK	1.38E-07	-38.6	-13.0	-25.6	GPRS, Ch 128, EUT vertical
1648.200	1.0	33.0	Horz	PK	1.20E-07	-39.2	-13.0	-26.2	GPRS, Ch 128, EUT horizontal
1648.542	1.0	121.0	Horz	PK	7.77E-08	-41.1	-13.0	-28.1	GPRS, Ch 128, EUT on side
1648.327	2.5	160.0	Vert	PK	7.42E-08	-41.3	-13.0	-28.3	EGPRS, Ch 128, EUT vertical
1672.993	1.1	148.0	Vert	PK	5.07E-08	-43.0	-13.0	-30.0	GPRS, Ch 190, EUT vertical
1648.442	3.7	135.0	Vert	PK	4.90E-08	-43.1	-13.0	-30.1	GPRS, Ch 128, EUT horizontal
2546.380	1.0	261.0	Vert	PK	2.87E-08	-45.4	-13.0	-32.4	GPRS, Ch 251, EUT vertical
2509.467	1.0	269.0	Vert	PK	2.64E-08	-45.8	-13.0	-32.8	EGPRS, Ch 190, EUT vertical
1673.313	1.6	156.0	Vert	PK	1.76E-08	-47.5	-13.0	-34.5	EGPRS, Ch 190, EUT vertical
2509.473	1.0	271.0	Vert	PK	1.52E-08	-48.2	-13.0	-35.2	GPRS, Ch 190, EUT vertical
1697.793	1.0	276.0	Vert	PK	1.44E-08	-48.4	-13.0	-35.4	EGPRS, Ch 251, EUT vertical
1697.713	1.0	83.0	Vert	PK	1.44E-08	-48.4	-13.0	-35.4	GPRS, Ch 251, EUT vertical
3296.567	1.0	194.0	Vert	PK	8.65E-09	-50.6	-13.0	-37.6	GPRS, Ch 128, EUT vertical
3346.407	1.0	196.0	Vert	PK	7.33E-09	-51.3	-13.0	-38.3	GPRS, Ch 190, EUT vertical
3393.960	1.0	203.0	Vert	PK	5.93E-09	-52.3	-13.0	-39.3	GPRS, Ch 251, EUT vertical
3296.813	1.0	202.0	Vert	PK	5.09E-09	-52.9	-13.0	-39.9	EGPRS, Ch 128, EUT vertical
3346.687	1.3	203.0	Vert	PK	5.07E-09	-52.9	-13.0	-39.9	EGPRS, Ch 190, EUT vertical
3394.853	1.0	223.0	Vert	PK	4.93E-09	-53.1	-13.0	-40.1	EGPRS, Ch 251, EUT vertical
2472.320	1.0	200.0	Vert	PK	4.33E-09	-53.6	-13.0	-40.6	GPRS, Ch 128, EUT vertical
2546.467	2.3	273.0	Vert	PK	3.15E-09	-55.0	-13.0	-42.0	EGPRS, Ch 251, EUT vertical
2474.093	1.7	188.0	Vert	PK	2.38E-09	-56.2	-13.0	-43.2	EGPRS, Ch 128, EUT vertical

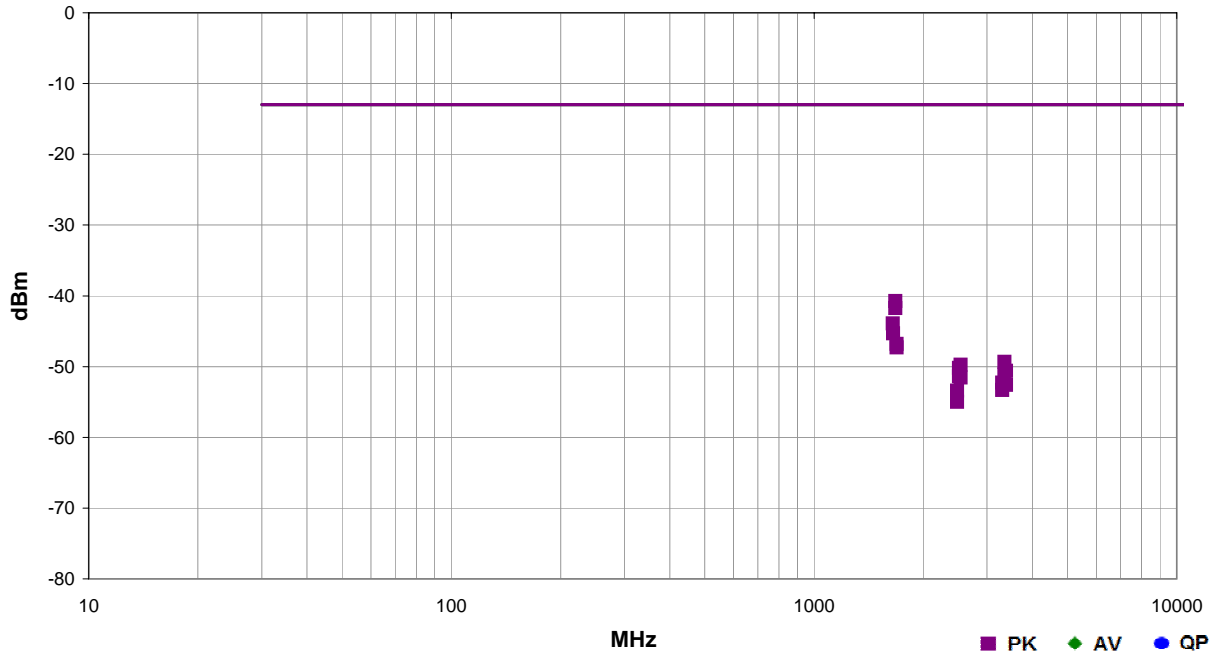


# Transmitter Spurious Emissions

Work Order:	ZONA0036	Date:	05/01/12	<i>Bryan Weller</i>
Project:	None	Temperature:	21.8 °C	
Job Site:	MN05	Humidity:	35.4% RH	
Serial Number:	4000000045	Barometric Pres.:	1014.3 mbar	
Tested by:			Bryan Weller	
EUT:	V3			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Transmitting WCDMA, cell channels 4132, 4182, and 4233.			
Deviations:	No deviations.			
Comments:	None			

Test Specifications	Test Method
FCC 22H:2012	ANSI/TIA/EIA-603-C:2004

Run #	8	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
1675.567	1.0	18.0	Horz	PK	8.42E-08	-40.7	-13.0	-27.7	WCDMA, Ch 4182 EUT Vertical
1675.520	1.0	102.0	Vert	PK	6.69E-08	-41.7	-13.0	-28.7	WCDMA, Ch 4182 EUT Vertical
1651.067	1.0	92.0	Vert	PK	4.08E-08	-43.9	-13.0	-30.9	WCDMA, Ch 4132 EUT Vertical
1651.200	1.0	37.0	Horz	PK	2.96E-08	-45.3	-13.0	-32.3	WCDMA, Ch 4132 EUT Vertical
1691.493	1.0	15.0	Horz	PK	2.08E-08	-46.8	-13.0	-33.8	WCDMA, Ch 4233 EUT Vertical
1691.467	1.0	77.0	Vert	PK	1.86E-08	-47.3	-13.0	-34.3	WCDMA, Ch 4233 EUT Vertical
3349.400	1.0	197.0	Vert	PK	1.17E-08	-49.3	-13.0	-36.3	WCDMA, Ch 4182 EUT Vertical
2537.973	1.0	87.0	Vert	PK	1.06E-08	-49.8	-13.0	-36.8	WCDMA, Ch 4233 EUT Vertical
2511.627	1.0	277.0	Vert	PK	9.60E-09	-50.2	-13.0	-37.2	WCDMA, Ch 4182 EUT Vertical
3387.340	1.0	192.0	Vert	PK	8.72E-09	-50.6	-13.0	-37.6	WCDMA, Ch 4233 EUT Vertical
3349.120	1.0	120.0	Horz	PK	7.70E-09	-51.1	-13.0	-38.1	WCDMA, Ch 4182 EUT Vertical
2510.927	1.9	200.0	Horz	PK	7.28E-09	-51.4	-13.0	-38.4	WCDMA, Ch 4182 EUT Vertical
2537.967	1.0	49.0	Horz	PK	6.99E-09	-51.6	-13.0	-38.6	WCDMA, Ch 4233 EUT Vertical
3304.947	1.0	276.0	Horz	PK	5.89E-09	-52.3	-13.0	-39.3	WCDMA, Ch 4132 EUT Vertical
3385.407	1.0	126.0	Horz	PK	5.49E-09	-52.6	-13.0	-39.6	WCDMA, Ch 4233 EUT Vertical
3305.240	1.1	172.0	Vert	PK	4.68E-09	-53.3	-13.0	-40.3	WCDMA, Ch 4132 EUT Vertical
2481.427	1.0	279.0	Vert	PK	4.57E-09	-53.4	-13.0	-40.4	WCDMA, Ch 4132 EUT Vertical
2481.340	1.0	184.0	Horz	PK	3.16E-09	-55.0	-13.0	-42.0	WCDMA, Ch 4132 EUT Vertical

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 WCDMA channels 9262, 9400, 9538.  
Transmitting GPRS, EGPRS, PCS channels 512, 661, and 810.

#### POWER SETTINGS INVESTIGATED

13.8 VDC

#### CONFIGURATIONS INVESTIGATED

ZONA0036 - 1

#### FREQUENCY RANGE INVESTIGATED

Start Frequency | 30 MHz | Stop Frequency | 20000 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
Antenna, Horn	ETS	3115	AJA	5/13/2011	24 mo
Universal Radio Communication	Rhode & Schwarz	CMU200	BSU	7/1/2011	NCR
High Pass Filter	Micro-Tronics	HPM50111	HGQ	7/9/2010	24 mo
1-2 GHz Notch Filter	K&L Microwave	3TNF-1000/2000-N/N	HGT	11/1/2010	24 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2/6/2012	12 mo
MN05 Cables	N/A	18-26GHz Standard Gain	EVD	2/6/2012	12 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	7/1/2011	12 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/1/2011	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/1/2011	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn	MNI	10/18/2011	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	1/24/2012	12 mo
Antenna X-Wing Bilog 30MHZ-	Teseq	CBL 6141B	AYD	12/19/2011	12 mo
Spectrum Analyzer	Agilent	E4446A	AAT	3/2/2012	12 mo
Power Sensor	Agilent	N1913A	SQL	9/23/2010	24 mo
Power Meter	Agilent	N8481A	SQN	9/23/2010	24 mo
Signal Generator	Agilent	N5183A	TIA	1/27/2012	12 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

#### MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

#### 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 1/2 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 1/2 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.

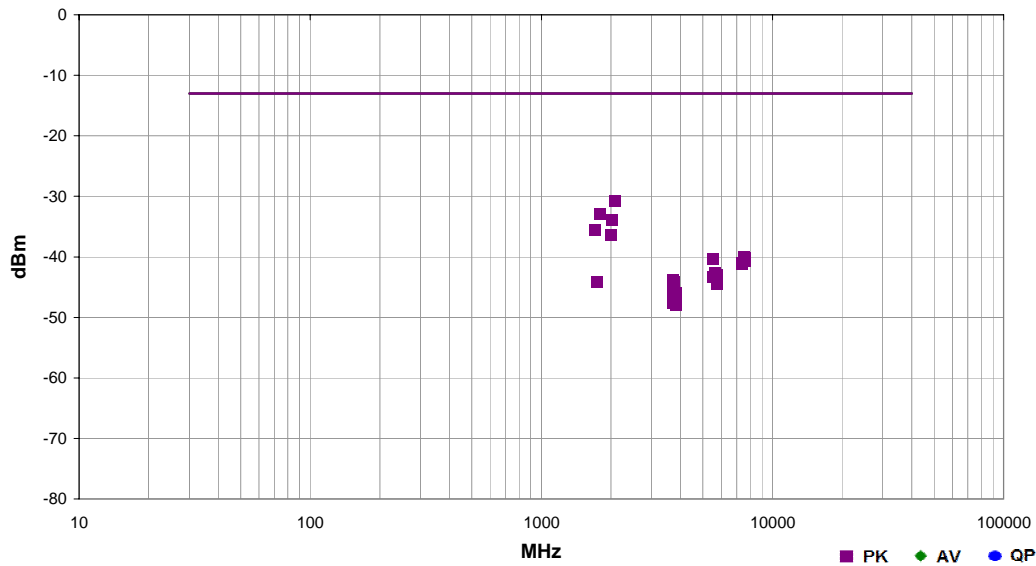


# Transmitter Spurious Emissions

<b>Work Order:</b>	ZONA0036	<b>Date:</b>	04/30/12	<i>Bryan Welles</i>
<b>Project:</b>	None	<b>Temperature:</b>	21.8 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	35.4% RH	
<b>Serial Number:</b>	400000045	<b>Barometric Pres.:</b>	1014.3 mbar	
<b>EUT:</b>	V3			
<b>Configuration:</b>	1			
<b>Customer:</b>	Zonar Systems, LLC			
<b>Attendees:</b>	None			
<b>EUT Power:</b>	13.8 VDC			
<b>Operating Mode:</b>	Transmitting GPRS, EGPRS, PCS channels 512, 661, and 810.			
<b>Deviations:</b>	No deviations.			
<b>Comments:</b>	None			

<b>Test Specifications</b>	<b>Test Method</b>
FCC 24E:2012	ANSI/TIA/EIA-603-C:2004

<b>Run #</b>	2	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1-4m	<b>Results</b>	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
2082.352	2.3	19.0	Horz	PK	8.30E-07	-30.8	-13.0	-17.8	GPRS, Ch 810, EUT horizontal
1794.631	1.0	283.0	Vert	PK	5.11E-07	-32.9	-13.0	-19.9	GPRS, Ch 810, EUT horizontal
2023.001	1.0	126.0	Vert	PK	4.12E-07	-33.9	-13.0	-20.9	GPRS, Ch 512, EUT vertical
1707.262	2.9	236.0	Vert	PK	2.83E-07	-35.5	-13.0	-22.5	GPRS, Ch 661, EUT horizontal
1995.026	2.4	163.0	Horz	PK	2.29E-07	-36.4	-13.0	-23.4	GPRS, Ch 661, EUT horizontal
7518.667	1.6	279.0	Horz	PK	9.92E-08	-40.0	-13.0	-27.0	GPRS, Ch 661, EUT horizontal
7641.100	2.0	102.0	Horz	PK	9.71E-08	-40.1	-13.0	-27.1	EGPRS, Ch 810, EUT horizontal
7520.787	1.0	143.0	Horz	PK	9.25E-08	-40.3	-13.0	-27.3	EGPRS, Ch 661, EUT horizontal
5550.733	1.2	236.0	Horz	PK	9.17E-08	-40.4	-13.0	-27.4	GPRS, Ch 512, EUT horizontal
7638.027	1.0	328.0	Horz	PK	8.67E-08	-40.6	-13.0	-27.6	GPRS, Ch 810, EUT horizontal
7399.867	1.0	286.0	Horz	PK	7.85E-08	-41.0	-13.0	-28.0	GPRS, Ch 512, EUT horizontal
7402.493	1.0	154.0	Horz	PK	7.51E-08	-41.2	-13.0	-28.2	EGPRS, Ch 512, EUT horizontal
5640.160	1.0	229.0	Horz	PK	5.48E-08	-42.6	-13.0	-29.6	GPRS, Ch 661, EUT horizontal
5639.980	1.0	234.0	Horz	PK	5.36E-08	-42.7	-13.0	-29.7	EGPRS, Ch 661, EUT horizontal
5729.573	1.2	12.0	Horz	PK	5.08E-08	-42.9	-13.0	-29.9	GPRS, Ch 810, EUT horizontal
5550.647	1.3	215.0	Horz	PK	4.60E-08	-43.4	-13.0	-30.4	EGPRS, Ch 512, EUT horizontal
3700.620	1.8	12.0	Horz	PK	4.10E-08	-43.9	-13.0	-30.9	EGPRS, Ch 512, EUT horizontal
3700.360	2.0	219.0	Horz	PK	4.10E-08	-43.9	-13.0	-30.9	GPRS, Ch 512, EUT horizontal
1735.287	1.0	28.0	Horz	PK	3.91E-08	-44.1	-13.0	-31.1	GPRS, Ch 512, EUT vertical
3760.213	1.6	78.0	Horz	PK	3.81E-08	-44.2	-13.0	-31.2	GPRS, Ch 661, EUT horizontal
3700.127	1.1	301.0	Vert	PK	3.65E-08	-44.4	-13.0	-31.4	GPRS, Ch 512, EUT vertical
5729.493	1.0	21.0	Horz	PK	3.60E-08	-44.4	-13.0	-31.4	EGPRS, Ch 810, EUT horizontal
3760.160	1.7	78.0	Horz	PK	3.17E-08	-45.0	-13.0	-32.0	EGPRS, Ch 661, EUT horizontal
3700.267	1.0	94.0	Vert	PK	2.64E-08	-45.8	-13.0	-32.8	GPRS, Ch 512, EUT horizontal
3700.453	1.0	168.0	Horz	PK	2.58E-08	-45.9	-13.0	-32.9	GPRS, Ch 512, EUT on side
3819.573	1.0	314.0	Horz	PK	2.55E-08	-45.9	-13.0	-32.9	GPRS, Ch 810, EUT horizontal
3700.687	1.0	38.0	Horz	PK	2.20E-08	-46.6	-13.0	-33.6	GPRS, Ch 512, EUT vertical
3700.247	1.2	113.0	Vert	PK	1.75E-08	-47.6	-13.0	-34.6	GPRS, Ch 512, EUT on side
3819.773	1.0	305.0	Horz	PK	1.61E-08	-47.9	-13.0	-34.9	EGPRS, Ch 810, EUT horizontal

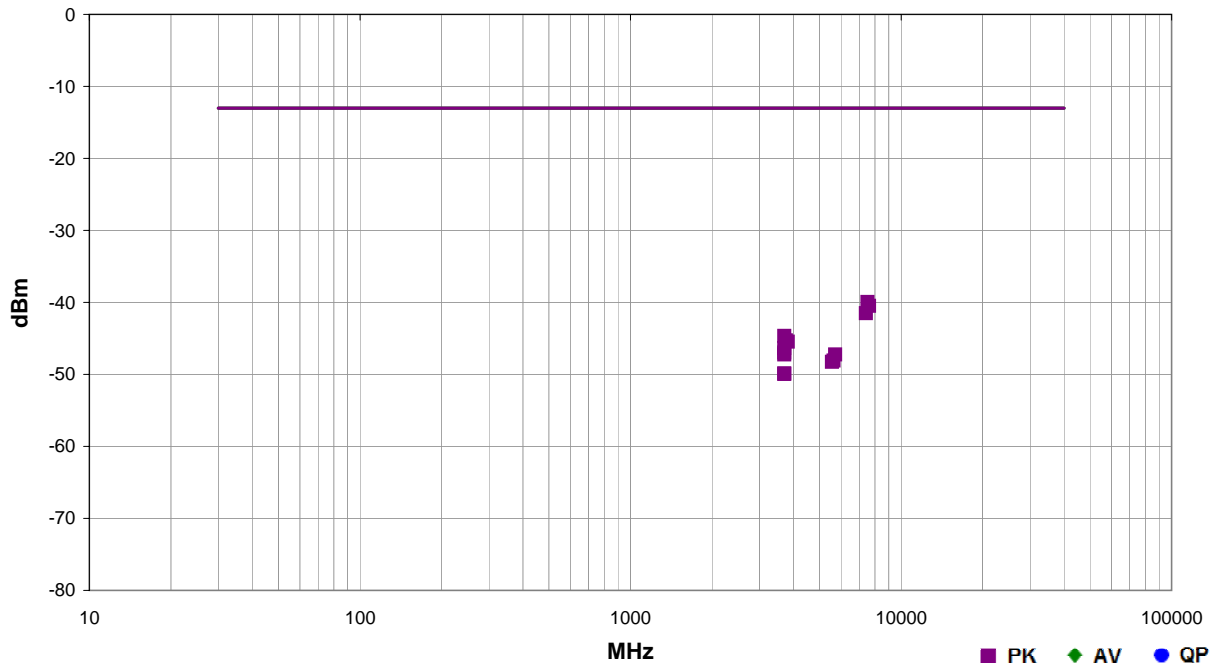


## Transmitter Spurious Emissions

<b>Work Order:</b>	ZONA0036	<b>Date:</b>	04/30/12	<i>Bryan Welles</i>
<b>Project:</b>	None	<b>Temperature:</b>	21.8 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	35.4% RH	
<b>Serial Number:</b>	4000000045	<b>Barometric Pres.:</b>	1014.3 mbar	
<b>EUT:</b>	V3	<b>Tested by:</b> Johnathan Lee		
<b>Configuration:</b>	1			
<b>Customer:</b>	Zonar Systems, LLC			
<b>Attendees:</b>	None			
<b>EUT Power:</b>	13.8 VDC			
<b>Operating Mode:</b>	Transmitting WCDMA channels 9262, 9400, 9538.			
<b>Deviations:</b>	No deviations.			
<b>Comments:</b>	None			

<b>Test Specifications</b>	<b>Test Method</b>
FCC 24E:2012	ANSI/TIA/EIA-603-C:2004

<b>Run #</b>	6	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1-4m	<b>Results</b>	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
7523.500	1.9	29.0	Horz	PK	1.01E-07	-39.9	-13.0	-26.9	WCDMA, Ch 9400, EUT horizontal
7629.367	2.6	178.0	Horz	PK	8.89E-08	-40.5	-13.0	-27.5	WCDMA, Ch 9538, EUT horizontal
7413.550	3.8	121.0	Horz	PK	7.07E-08	-41.5	-13.0	-28.5	WCDMA, Ch 9262, EUT horizontal
3703.187	1.6	230.0	Horz	PK	3.42E-08	-44.7	-13.0	-31.7	WCDMA, Ch 9262, EUT horizontal
3758.550	1.5	228.0	Horz	PK	2.95E-08	-45.3	-13.0	-32.3	WCDMA, Ch 9400, EUT horizontal
3816.317	1.7	319.0	Horz	PK	2.85E-08	-45.5	-13.0	-32.5	WCDMA, Ch 9538, EUT horizontal
3706.883	1.2	123.0	Vert	PK	2.33E-08	-46.3	-13.0	-33.3	WCDMA, Ch 9262, EUT vertical
3702.583	1.1	345.0	Horz	PK	2.01E-08	-47.0	-13.0	-34.0	WCDMA, Ch 9262, EUT vertical
3706.093	1.3	160.0	Vert	PK	1.89E-08	-47.2	-13.0	-34.2	WCDMA, Ch 9262, EUT horizontal
5720.800	3.4	125.0	Horz	PK	1.88E-08	-47.3	-13.0	-34.3	WCDMA, Ch 9538, EUT horizontal
5640.150	1.0	158.0	Horz	PK	1.55E-08	-48.1	-13.0	-35.1	WCDMA, Ch 9400, EUT horizontal
5556.467	1.0	54.0	Horz	PK	1.49E-08	-48.3	-13.0	-35.3	WCDMA, Ch 9262, EUT horizontal
3702.950	1.0	64.0	Vert	PK	1.03E-08	-49.9	-13.0	-36.9	WCDMA, Ch 9262, EUT on side
3703.167	1.0	36.0	Horz	PK	1.01E-08	-50.0	-13.0	-37.0	WCDMA, Ch 9262, 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

13.8 VDC

### CONFIGURATIONS INVESTIGATED

ZONA0036 - 1

### FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12500 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
Antenna, Horn	ETS	3115	AJA	5/13/2011	24 mo
Universal Radio Communication Tester	Rhode & Schwarz	CMU200	BSU	7/1/2011	NCR
Spectrum Analyzer	Agilent	E4446A	AAT	5/3/2012	12 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/1/2011	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/1/2011	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn	MNI	10/18/2011	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	1/24/2012	12 mo
Antenna X-Wing Bilog 30MHZ-	Teseq	CBL 6141B	AYD	12/19/2011	12 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

### MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

### TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT. Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

The EUT arrangement is configured as equivalent to that occurring in normal use. Tabletop equipment is placed on a 0.8 meter high non-conductive table & for Floor-standing equipment, it is placed on, but insulated from a ground reference plane by the use of its own rollers or stand-off supports. If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT.

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.

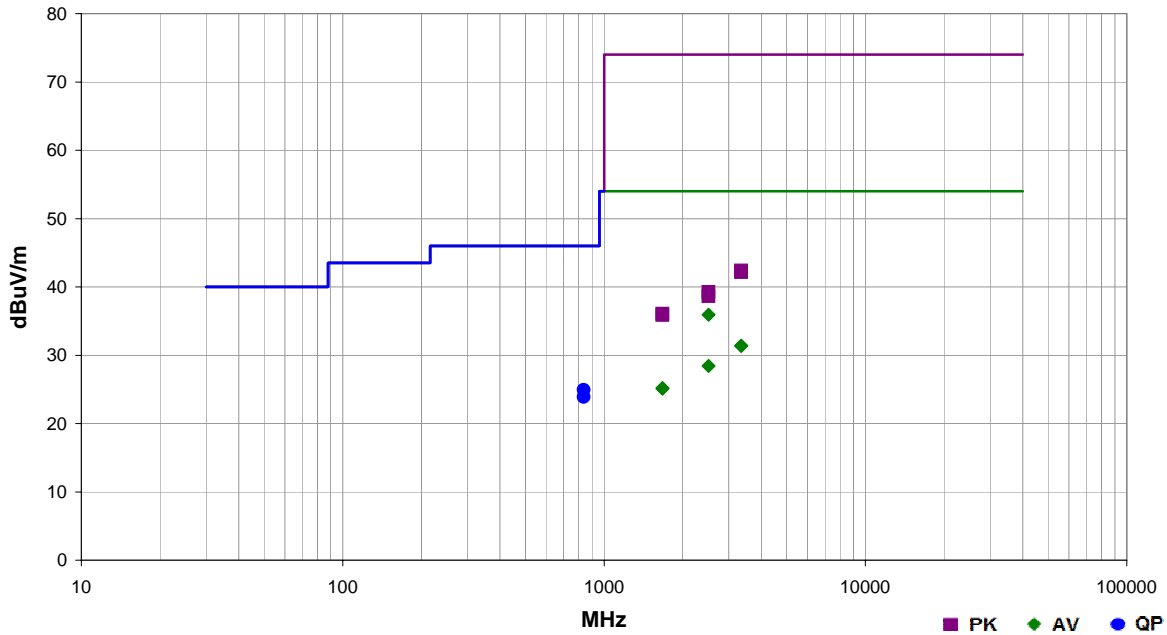


## Receiver Spurious Emissions

Work Order:	ZONA0036	Date:	05/01/12	<i>Bryan Weller</i>
Project:	None	Temperature:	21.8 °C	
Job Site:	MN05	Humidity:	35.4% RH	
Serial Number:	4000000045	Barometric Pres.:	1014.3 mbar	
EUT:	V3			
Configuration:	1			
Customer:	Zonar Systems, LLC			
Attendees:	None			
EUT Power:	13.8 VDC			
Operating Mode:	Receiving GPRS, cell mid channel.			
Deviations:	No deviations.			
Comments:	EUT Vertical.			

Test Specifications	Class B	Test Method
FCC 15.109:2012		ANSI C63.4:2009

Run #	9	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
2508.973	39.3	-3.4	2.8	48.0	3.0	0.0	Horz	AV	0.0	35.9	54.0	-18.1	GPRS, Ch 190, EUT vertical
836.382	17.2	7.7	1.0	242.0	3.0	10.0	Vert	QP	0.0	24.9	46.0	-21.1	GPRS, Ch 190, EUT vertical
836.356	16.2	7.7	1.0	174.0	3.0	10.0	Horz	QP	0.0	23.9	46.0	-22.2	GPRS, Ch 190, EUT vertical
3348.000	32.5	-1.1	3.9	117.0	3.0	0.0	Vert	AV	0.0	31.4	54.0	-22.6	GPRS, Ch 190, EUT vertical
3347.120	32.5	-1.1	1.0	95.0	3.0	0.0	Horz	AV	0.0	31.4	54.0	-22.6	GPRS, Ch 190, EUT vertical
2508.693	31.8	-3.4	1.1	98.0	3.0	0.0	Vert	AV	0.0	28.4	54.0	-25.6	GPRS, Ch 190, EUT vertical
1671.427	30.8	-5.6	2.1	118.0	3.0	0.0	Vert	AV	0.0	25.2	54.0	-28.8	GPRS, Ch 190, EUT vertical
1674.907	30.7	-5.6	1.5	247.0	3.0	0.0	Horz	AV	0.0	25.1	54.0	-28.9	GPRS, Ch 190, EUT vertical
3344.613	43.5	-1.1	1.0	95.0	3.0	0.0	Horz	PK	0.0	42.4	74.0	-31.6	GPRS, Ch 190, EUT vertical
3344.827	43.3	-1.1	3.8	117.0	3.0	0.0	Vert	PK	0.0	42.2	74.0	-31.8	GPRS, Ch 190, EUT vertical
2511.727	42.6	-3.3	2.8	48.0	3.0	0.0	Horz	PK	0.0	39.3	74.0	-34.7	GPRS, Ch 190, EUT vertical
2508.380	42.0	-3.4	1.1	98.0	3.0	0.0	Vert	PK	0.0	38.6	74.0	-35.4	GPRS, Ch 190, EUT vertical
1674.527	41.7	-5.6	1.5	247.0	3.0	0.0	Horz	PK	0.0	36.1	74.0	-37.9	GPRS, Ch 190, EUT vertical
1674.553	41.5	-5.6	3.3	197.0	3.0	0.0	Vert	PK	0.0	35.9	74.0	-38.1	GPRS, Ch 190, EUT vertical