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> TEST REPORT #: 310025 LSR Job #: C-828

Compliance Testing of: 2.4 GHz Radio

<u>Test Date(s)</u>: January 26-28, February 1-5, 15-16, March 3, 2010

Prepared For: Saflok 31750 Sherman Ave Madison Heights, MI 48071

> In accordance with: Federal Communications Commission (FCC) Part 15, Subpart C, Section 15.247 Industry Canada (IC) RSS 210 Annex 8 Digital Modulation Transmitters (DTS) Operating in the Frequency Band 2400 MHz – 2483.5 MHz

This Test Report is issued under the Authority of:			
Signature: Thomas TSmith Dat	e: 06.08.10		
Test Report Reviewed by:	Tested by:		
	Peter Feilen, EMC Engineer		
Signature: Date: 06.08.10	Signature: Inter Signature: Date: 04.03.10		

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EXHIBIT 1. INTRODUCTION

1.1 <u>SCOPE</u>

References:	FCC Part 15, Subpart C, Section 15.247 and 15.209	
	RSS GEN and RSS 210 Annex 8	
Title:	FCC : Telecommunication – Code of Federal Regulations,	
	CFR 47, Part 15.	
Purpose of Test:	To gain FCC and IC Certification Authorization for Low-	
-	Power License-Exempt Transmitters.	
Test Procedures:	Both conducted and radiated emissions measurements	
	were conducted in accordance with American National	
	Standards Institute ANSI C63.4 – American National	
	Standard for Methods of Measurement of Radio-Noise	
	Emissions from Low-Voltage Electrical and Electronic	
	Equipment in the Range of 9 kHz to 40 GHz.	
Environmental Classification:	Commercial, Industrial or Business	
	Residential	

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2008-10	Code of Federal Regulations - Telecommunications
RSS 210 Annex 8	2007 June	Low-power License-exempt Radio- communication Devices (All Frequency Bands): Category I Equipment
ANSI C63.4	2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.
FCC Procedures	2007	Measurement of Digital Transmission Systems operating under Section 15.247.

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1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. Accreditation status can be verified at A2LA's web site: <u>www.a2la2.net</u>.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 <u>TEST EQUIPMENT UTILIZED</u>

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated by an ISO 17025 accredited calibration laboratory, traceable to the SI standard.

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	Saflok
Address:	31750 Sherman Ave, Madison Heights, MI 48071
Contact Name:	Jim Mills

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Messenger EM
Model Number:	A28900
Serial Number:	NA

2.3 ASSOCIATED ANTENNA DESCRIPTION

A chip SMT antenna is used. It has a maximum gain of 1.3dBi, and an average gain of -0.5dBi. Please see Appendix E for further information within the manufacturer's specification sheet.

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EUT'S TECHNICAL SPECIFICATIONS 2.4

Additional Information:

EUT Frequency Range (in MHz)	2405-2480 MHz
RF Power in Watts	
Minimum:	.000659 W (@ 2405 MHz)
Maximum:	.000714 W (@ 2480 MHz)
Conducted Output Power (in dBm)	-1.461 (Maximum @ 2480 MHz)
Field Strength at 3 meters	99.03 dBuV (@ 2405 MHZ)
Occupied Bandwidth (99% BW)	4.45 MHz
Type of Modulation	QPSK
Emission Designator	4M45G1D
EIRP (in mW)	.632 mW
Transmitter Spurious (worst case) at 3	24.9 dBuV/m (@ 298 MHz)
meters	
Receiver Spurious (worst case) at 3	33.2 dBuV/m (@ system noise floor)
meters	
Frequency Tolerance %, Hz, ppm	Greater than 100 ppm
Microprocessor Model # (if applicable)	CC2430F32
Antenna Information	
Detachable/non-detachable	Non-detachable
Туре	Chip
Gain (in dBi)	+1.3 pk, -0.5 Avg
EUT will be operated under FCC Rule	15.247
Part(s)	
Modular Filing	Yes No
Portable or Mobile	Portable

RF Technical Information:

Type of		SAR Evaluation: Device Used in the Vicinity of the Human Head
Evaluation		SAR Evaluation: Body-worn Device
(check one)	Х	RF Evaluation

If <u>RF Evaluation</u> checked above, test engineer to complete the following:

- Evaluated against exposure limits: 🖾 General Public Use Controlled Use •
- Duty Cycle used in evaluation: ______100____ %
- Standard used for evaluation: OET 65 • 20 cm
- Measurement Distance: ______
 - 0.00192 ____ V/m W/m² 🗌 A/m RF Value: ____ Measured Computed Calculated

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2.5 **PRODUCT DESCRIPTION**

This product is a door lock activated wireless transmitter for system controls in the hospitality industry. The radio turns on once the door lock is activated via a key card, and then the devices in the room are activated, such as lighting or temperature control units. The transceiver can operate between 2405 and 2480 MHz and uses a chip antenna. The unit is to be supplied by 6 VDC.

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EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	15-35 °C
Humidity:	30-60 %
Pressure:	86-106 kPa

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC and IC Paragraph	Test Requirements	Compliance (yes/no)
FCC : 15.247(a)(2) IC : RSS 210 A8.2(a)	6 dB Bandwidth of a Digital Modulation System	Yes
IC : RSS GEN section 4.6.1	20 dB Bandwidth	Yes
FCC : 15.247(b) & 1.1310 IC : RSS 210 A8.4	Maximum Output Power	Yes
FCC : 15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093 IC : RSS 102	RF Exposure Limit	Yes
FCC :15.247(c) IC : RSS 210 A8.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
FCC : 15.247(d) IC : RSS 210 A8.2(b)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
FCC : 15.247(c), 15.209 & 15.205 IC : RSS 210 A8.2(b), section 2.2, 2.6 and 2.7	Transmitter Radiated Emissions	Yes
The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been		

Class B Digital Devices (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers (RSS GEN and RSS 210 of IC). The Receiver Test Report is available upon request.

3.3 <u>MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES</u> None Yes (explain below)

3.4 <u>DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS</u> ⊠ None □ Yes (explain below)

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EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210, Issue 7 (2007), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

If some emissions are seen to be within 3 dB of their respective limits:

As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

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EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 <u>Test Setup</u>

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in transmit and receive modes, and final testing was performed using each mode, using power as provided by AA batteries to create 6 VDC. The unit has the capability to operate on 15 channels, controllable for test purposes via a button on the radio board.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (2405 MHz), middle (2445 MHz) and high (2480 MHz) to comply with FCC Part 15.31. The channels were changed using a button on the radio board. The test mode was programmed with a development board.

5.2 <u>Test Procedure</u>

The frequency range from 30-25000 MHz was scanned and investigated for radiated RF measurements. From 30-4000MHz radiated RF measurements were performed in a on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. From 30-300 MHz a Biconical antenna was used. From 300-1000 MHz a Log Periodic antenna was used. From 1000-5000 MHz a Double-Ridged Waveguide Horn Antenna was used. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT.

From 4000-25000 MHz the EUT was measured at a 1.0 meter separation in a compact semianechoic chamber. From 4-18GHz a Double-Ridged Waveguide Horn Antenna and pre-amplifier was used and from 18-25 GHz a standard gain Horn antenna and pre-amplifier was used. The antenna was raised from 1.0-1.8 m. The EUT was placed on a non-conductive pedestal. The turntable was rotated and the radiated RF emission levels were noted at various fixed degree and antenna height settings.

The battery voltage was checked frequently, and the batteries were replaced as necessary.

The EUT was rotated along three orthogonal axis during the investigations to find the highest emission levels.

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5.3 <u>Test Equipment Utilized</u>

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at a ISO/IEC 17025 accredited Calibration laboratory, and traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an Agilent E4445A/N9039A EMI System. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 3 MHz for measurements above 1 GHz (video bandwidth of 50 MHz). From 4 GHz to 18 GHz, an Agilent E4446A Spectrum Analyzer and an EMCO Double-Ridge Horn Antenna were used. From 18 GHz to 25 GHz, the Agilent E4446A Spectrum Analyzer with a standard gain horn, and preamp were used.

Test Equipment	Manufacturer	Model No.	Serial No.
EMI Receiver	Agilent	E4445A	MY48250225
EMI Receiver Pre-Select.	Agilent	N5181A	MY49060062
Spectrum Analyzer	Agilent	E4446A	US45300564
Log Periodic Antenna	EMCO	93146	9701-4855
Horn Antenna	EMCO	3115	6907
Bicon Antenna	EMCO	93110B	9702-2918
Pre-Amp	Adv. Microwave	WLA612	1145A04094
Horn Antenna – Std. Gain	EMCO	3160-09	9809-1120

Test Equipment List

5.4 <u>Test Results</u>

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 and Canada RSS-210, Issue 7 (2007), Annex 8 for a DTS transmitter. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

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5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 2400-2483.5 MHz band, as specified in Title 47 CFR 15.247 (b)(3) and RSS 210 A8.4 is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d) and RSS 210 A8.2(b), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and section 2.2,2.6 and 2.7 of RSS 210 for IC.

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

Frequency (MHz)	3 m Limit μV/m	3 m Limit (dBµV/m)	1 m Limit (dBµV/m)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
>960	500	54.0	63.5

Sample conversion from field strength μ V/m to dB μ V/m: dB μ V/m = 20 log ₁₀ (100) = 40 dB μ V/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

960 MHz to 10,000 MHz 500 μ V/m or 54.0 dB/ μ V/m at 3 meters 54.0 + 9.5 = 63.5 dB/ μ V/m at 1 meter

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RADIATED EMISSIONS TEST DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions Test Standard: 47CFR, Part 15.205 and 15.247(DTS) RSS 210 A8, sections 2.2,2.6 and 2.7 Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	Saflok							
Date(s) of Test:	Febr	-ebruary 2, 4, 5, 9, March 3, 2010						
Test Engineer(s):	Pete	r Feilen						
Voltage:	6.0 \	/DC						
Operation Mode:	Mod	ulated Continuous Transm	it Mo	ode				
Environmental	Tem	Temperature: 20 – 25°C						
Conditions in the Lab:	Relative Humidity: 30 – 60 %							
		Single PhaseVAC			3 Phase	V	AC	
EUT FOWEI.	Х	Battery			Other:			
EUT Placement:	Х	80cm non-conductive tak	ole		10cm Space	cers		
ELIT Test Location:	v	3 Meter Semi-Anechoic			3/10m 04	ге		
	^	FCC Listed Chamber			3/1011 OA	13		
Measurements:		Pre-Compliance		Prel	iminary	Х	Final	
Detectors Used:	Х	Peak	Х	Qua	si-Peak	Х	Average	

The following table depicts the level of significant spurious radiated RF emissions found:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	Limit (dBµV/m)	Margin (dB)
49.8	V/H	1.00	0	10.8	40.0	29.2
72.2	V/H	1.00	0	8.8	40.0	31.2
99.9	V/H	1.31	0	10.2	43.5	33.3
116.2	V/H	1.52	0	11.9	43.5	31.6
180.3	V/H	1.00	0	24.3	43.5	19.2
185.7	V/H	1.00	0	16.9	43.5	26.6
216.0	V/H	1.00	254	16.8	46.0	29.2
247.10	V/H	1.00	0	22.5	46.0	23.5
298.26	V/H	1.00	0	24.9	46.0	31.1
968.0	V/H	1.00	0	22.2	54.0	31.8
999.2	V/H	1.00	0	20.9	54.0	33.1

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RADIATED EMISSIONS DATA CHART (continued)

	Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	4811.00	H/H	1.18	119.9	63.6 NOTE 4	63.5	-0.1
ſ	7214.40	H/H	1.03	331.7	68.6	79.0	10.4
ſ	9619.53	H/H	1.15	164.8	52.8	79.0	26.2
	12020.63	H/H	1.06	159.8	43.2	63.5	20.3
	14424.73	H/H	1.13	32.5	43.5	79.0	35.5
	16841.23	H/H	1.11	166.5	41.0	79.0	38.0
	4810.83	V/F	1.49	149.1	54.7	63.5	8.8
	7216.47	V/F	1.33	185.0	62.3	79.0	16.7
	9619.70	V/F	1.06	6.9	47.5	79.0	31.5
	12021.63	V/F	1.21	322.6	40.3	63.5	23.2
	14428.93	V/F	1.11	136.6	41.3	79.0	37.7
	16837.30	V/F	1.03	6.0	41.0	79.0	38.0

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 18:

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4889.23	H/H	1.16	52	55.4	63.5	8.1
7333.97	H/H	1.10	325	51.0	63.5	12.5
9782.53	H/H	1.00	288	49.9	79.0	29.1
12228.63	H/H	1.10	158	41.8	63.5	21.7
14674.63	H/H	1.03	9	39.9	79.0	39.1
17119.47	H/H	1.06	18	42.9	79.0	36.1
4890.27	V/F	1.30	126	47.4	63.5	16.1
7333.83	V/F	1.22	200	47.3	63.5	16.2
9782.17	V/F	1.03	223	43.2	79.0	35.8
12228.00	V/F	1.24	189	40.8	63.5	22.7
14670.53	V/F	1.04	51	40.0	79.0	39.0
17122.07	V/F	1.05	5	43.0	79.0	36.0

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The following tabl	a donicto the loval of	ignificant radiated D	fundamental and harmonic	amicciane coop on Channel 24.
THE TOHOWING LADI	e depicts the level of a	Siuliilillalli laulaleu Kr	- 101104111911141 4110 11411101110	

Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4960.27	H/H	1.11	51	50.7	63.5	12.8
7439.77	H/H	1.03	326	39.1	63.5	24.4
9918.40	H/H	1.04	299	40.9	79.0	38.1
12408.50	H/H	1.03	7	38.1	63.5	25.4
14886.17	H/H	1.03	7	39.8	79.0	39.2
17368.67	H/H	1.03	5	43.8	79.0	35.2
4960.43	V/F	1.03	58	43.6	63.5	19.9
7441.67	V/F	1.19	201	37.1	63.5	26.4
9924.53	V/F	1.13	203	38.5	79.0	40.5
12407.43	V/F	1.25	7	37.9	63.5	25.6
14880.97	V/F	1.03	7	40.0	79.0	39.0
17355.17	V/F	1.04	9	44.2	79.0	34.8

Notes:

1) A Quasi-Peak Detector was used for all measurements below 1 GHz, and a Peak Detector was used for measurements above 1 GHz. Measurements documented in the data charts with a frequency greater than 1 GHz were taken using a 10 Hz video averaged peak detector in compliance with the spurious radiated emissions procedure outlined in OET KDB Publication Number 550874. Additionally, measurements were verified using the peak detector with VBW>RBW to ensure the peak emissions did not exceed 20 dB above the stated average limits.

Measurements above 4 GHz were made at 1 meters of separation from the EUT

2) 3) For measurements of the fundamental power, because of spectral bandwidth, the receiver was set to RBW=3MHz, VBW=50MHz.

4) Duty cycle relaxation was invoked. 26 dB of relaxation can be applied. Please reference Appendix D for justification.

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5.7 <u>Test Setup Photo(s) – Radiated Emissions Test</u>



Radiated Emissions Setup

Horizontal Orientation Close-up



NOTE: All orientations were investigated, and the above orientation demonstrated worst case orientation. Data provided is reflective of this testing orientation.

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5.8 Screen Captures - Radiated Emissions Test

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and a 10 Hz video averaged peak detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 11, 18, or 26, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

₩ Agilent 00:04:59 Feb 5, 2010 R T	Trace
Meas At Mkr EMI Peak: N/A Presel: OP: N/A Input: RF Path: Filter Emissions EMI Avg: N/A Atten: 0 dB Gain: 0N	Тгасе 1 <u>2</u> 3
Mkr1 216.41 MHz	Clear Write
Ref /1.99 dB µ V #Atten 10 dB 43.40 dB µ V #EmiPk Log 10	Max Hold
	Min Hold
	View
LgAv	Blank
MI S2 S3 XS Start 30.0 MHz ^ Stop 300.0 MHz Res BW (CISPR) 120 kHz VBW 1.2 MHz Sweep 147.4 ms (8192 pts)	More 1 of 2
Copyright 2000–2009 Agilent Technologies	

Channel 18, Antenna Horizontally Polarized, 30-300 MHz, at 3m

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<u>Screen Captures - Radiated Emissions Testing</u> (continued)

🔆 Ag	ilent 00):02:24	Feb 5,	2010					R	Т	Trace	
Emissio	Mea 99	s At M 99.23 M	kr EMI Hz QP: EMI	Peak:3 Avg:2	4.49 dE 9.06 dE 2.42 dE	BuV P BuV BuV I	Presel: Input: f Atten:	RF ØdB	Path: F Gain: C	ilter N	1 <u>2</u> Tra	асе 3
								Mk	r1 997	'.7 MHz	Clear Wi	rite
Ref 60 #EmiPk Log 5	dBµV		#Atten	10 dB					35.32	dBµV	Max H	lold
dB/											Min H	lold
				والمتراجع المتراط	al failer and	وي المار المريد	Algebergerser A.	(ejetalan, station	المذار ويود والإولة والإروال		v	iew
LgAv M1 S2	(Alleine He	. Marine									BI	ank
S3 XS Start 3 Res BW	00.0 M I (CISP	Hz ^ R) 120	kHz	VB	W 1.2 M	1Hz	Sweep	Stop 383.7 n	o 1.000 ns (150	0 GHz 0 pts)	M (ore of 2
File 0	peratio	on Stat	us, C:	B03L0	GV9.A	NT file	e loade	d				

Channel 18, Antenna Horizontally Polarized, 300-1000 MHz, at 3m

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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🔆 Agilent 02:06:12 Feb 2, 2010		RT	Peak Search
Meas At Mkr EMI Peak: OP: Emissions EMI Avg:	V/A Presel: V/A Input: RF V/A	Path: Bypass	Next Peak
	Mkr1	2.375 70 GHz	Next Pk Right
Ref 107 dB µ V #Atten 10 dB #EmiPk Log		52.41 dBµV	Next Pk Left
dB/			Min Search
		\$F	⁹ k-Pk Search
LgAv			Mkr → CF
W1 S2 S3 FS Start 2.310 00 GHz Res BW (CISPR) 1 MHz #V	Stop BW 10 Hz Sweep 9.173	2.390 00 GHz 3 s (1500 pts)	More 1 of 2
File Operation Status, C:\3MCB	9.CBL file loaded		

Channel 11, Antenna Horizontally Polarized, 1000-2310 MHz, at 3m

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 20 of 55

₭ Agilent 01:58:30 Feb 2, 2010 R T	Peak Search
Meas At Mkr EMI Peak: N/A Presel: OP: N/A Input: RF Path: Bypass Emissions EMI Avg: N/A Input: RF Path: Bypass	Next Peak
Marker 2.319230000 GHz Mkr1 2.319 23 GHz	Next Pk Right
Ref 107 dBµV #Atten 10 dB 67.33 dBµV	
	Next Pk Left
10 dB/	Min Search
	Pk-Pk Search
LgAv	Mkr → CF
M1 S2 S3 FS	More
Start 2.310 00 GHz Stop 2.390 00 GHz Res BW (CISPR) 1 MHz #VBW 1 MHz Sweep 999.3 µs (1500 pts)	1 of 2
File Operation Status, C:\3MCBL9.CBL file loaded	

Channel 11, Antenna Horizontally Polarized, 2310-2390 MHz, at 3m

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 21 of 55

Screen Captures - Radiated Emissions Testing (continued)

Channel 11, Antenna Horizontally Polarized, Highest Fundamental Emission, at 3m



Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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LSR Job #: C-828	Serial #:N/A	Page 22 of 55

ዡ Agilent 01:31:37 Feb 2, 2010	Peak Search
Meas At Mkr EMI Peak: N/A Presel: OP: N/A Input: RF Path: Bypas Emissions EMI Avg: N/A Input: RF Path: Bypas	Next Peak
Mkr1 2.483 500 G	Next Pk Right
Ref 10/dBµV #Htten 10 dB 58.05 dBµ #EmiPk Log 10	Next Pk Left
	Min Search
	Pk-Pk Search
	Mkr → CF
MI 52 S3 FS Start 2.483 50 GHz Stop 2.500 00 GH Res BW (CISPR) 1 MHz #VBW 10 Hz Sweep 1.892 s (1500 pts	Z 1 of 2
File Operation Status, C:\3MCBL9.CBL file loaded	

Channel 18, Antenna Horizontally Polarized, 2500-5000 MHz, at 3m

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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Screen Captures - Radiated Emissions Testing (continued)

🔆 Agi	ilent 16	:18:14	Jan 30), 2010							Display
Ref0c Peak	dBm		Atten	10 dB							Full Screen
Log 10 dB/											Display Line -25.00 dBm On <u>Off</u>
								and on be	Marcu	E.antha	
LgAv	and a state of the	eentwithin _{ged}	and a state of the	W. N.	and the second	how which we	Mapageral	and the second s			Limits
M1 S2 S3 FC A AA											Active Fctn Position• Center
£ (f): FTun Swp											Title⊦
Start 1 Res BW	.8.000 (3 MHz	GHz		VB	W 50 M	Hz	Sweep	Sto 17.52	p 25.0 ms (60	00 GHz 1 pts)	Preferences.
File Op	peratio	n Stat	us, C:\	BARU.	CBL fi	le load	ed				

Channel 18, Antenna Vertically Polarized, 18000-25000 MHz, at 1m

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 25 of 55

5.9 <u>Receive Mode Testing</u>

Per the requirements of RSS-210, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen Section 4.10.

The test setup, procedure, and equipment utilized were identical to that described in sections 5.1, 5.2, and 5.3 of this document.

Measurement data and screen captures from the receive tests are presented below:

Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
178.44	1.00	0	13.44	43.00	29.56	Horizontal	Horizontal
272.01	1.12	43	33.23	46.00	12.77	Horizontal	Horizontal

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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Screen Captures - Radiated Emissions Testing – Receive Mode

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 11, 18 and 26, with the sense antenna both in vertical and horizontal polarity for worst case presentations.



Channel 18, 30-300 MHz, Antenna Vertically Polarized at 3m

Channel 18, 300-1000 MHz, Antenna Vertically Polarized, at 3m

🔆 Agilent 23:5	8:40 Mar 3, 2010		RT	Trace
Meas (Emissions	At Mkr EMIPeak: N OP: N EMIAvg: N	/A Presel: /A Input: RF /A Atten: 0	Path: Filter dB Gain: 0N	Trace <u>1</u> 2 3
	2	,	Mkr1 990.34 MHz	Clear Write
Ref 81.99 dBµV #EmiPk Log	#Atten 10 dB		34.96 dBµV	Max Hold
dB/				Min Hold
	anginan kanadarah di manangan ka		<u></u>	View
LgAv				Blank
S3 XS Start 300.0 MHz Res BW (CISPR)	120 kHz #VB	, A 300 kHz Sweep 39:	Stop 1.000 0 GHz 3.2 ms (8192 pts)	More 1 of 2
File Operation	Status, C:\B03L0	GH9.ANT file loaded		

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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LSR Job #: C-828	Serial #:N/A	Page 27 of 55



Channel 18, 1000-4000 MHz, Antenna Vertically Polarized at 3m





Notes:

- 1. Across the three channels similar emissions were exhibited.
- 2. The worst case orientation is represented in the screen captures

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EXHIBIT 6. OCCUPIED BANDWIDTH:

6.1 Limits

For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 kHz.

6.2 Method of Measurements

Refer to ANSI C63.4 and FCC Procedures (2007) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) and RSS 210 A8.2(a) requires a minimum -6dBc occupied bandwidth of 500 kHz. In addition, Industry Canada (IC RSS GEN 4.6.1) requires the measurement of the -20dBc occupied bandwidth. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the Agilent E4446A spectrum analyzer. The loss from the cable was loaded into the analyzer and measurement corrections were made internally; thereby allowing direct measurements without the need for any further corrections. An Agilent model E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The EUT was configured to run in modulated continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement (6 dB bandwidth) when compared to the specified limit, is 1800 kHz, which is above the minimum of 500 kHz.

6.3 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

6.4 Test Data

Channel	Contor Fraguanau	Measured	Minimum	Measured
		-6 dBc Occ. BW	-6 dBc Limit	-20 dBc Occ.Bw
	(IVIEZ)	(kHz)	(kHz)	(kHz)
11	2405	1800	500	4450
18	2445	1750	500	3900
25	2480	1800	500	3700

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Screen Captures - OCCUPIED BANDWIDTH 6.5



Channel 11, -6 dBc Occupied Bandwidth



Channel 18, -6 dBc Occupied Bandwidth

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Representative Plot of -20dBc Occupied Bandwidth Channel 26, -20 dBc Occupied Bandwidth



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EXHIBIT 7.BAND-EDGE MEASUREMENTS

7.1 Method of Measurements

FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in Modulated Continuous Transmit Mode, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge. *The Lower Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level.*

The Upper Band-Edge limit, in this case, would be + 54 dBµV/m at 3m.



Screen Capture Demonstrating Compliance at the Lower Band-Edge

Screen Capture Demonstrating Compliance at the Higher Band-Edge

🔆 Agilent 01	:31:37 Feb 2	,2010			R	Т	Peak Search
Mea: Emissions	s At Mkr EMI OP: EMI	Peak: N/A N/A Avg: N/A	Pre: Inp	sel: ut: RF	Path: B	ypass	Next Peak
				Mkr1	2.483 50)0 GHz	Next Pk Right
Ref 107 dBµV #EmiPk Log	#Atten	10 dB			58.05	dBµV	Next Pk Left
dB/							Min Search
							Pk-Pk Search
LgAv							Mkr → CF
M1 S2 S3 FS Start 2.483 5 Res BW (CISPI	0 GHz R) 1 MHz	*VBW 10) Hz Sv	Stop Veep 1.892	2.500 0 s (1500	0 GHz) pts)	More 1 of 2

NOTE: Please reference appendix D. Peak Reading can be effectively corrected by -26dB to 32.05 dBuV using duty cycle correction.

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Conducted Measurements demonstrating band edge and spurious emission compliance



A greater than 20 dB delta is observed both at the lower and upper end of the band. Therefore the 20 dB difference between the fundamental and nearest out of band emission is demonstrated as compliant.

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EXHIBIT 8. POWER OUTPUT (CONDUCTED): 15.247(b)

8.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable for the spectrum analyzer. The loss from the cable is added on the analyzer using a correction file as part of the internal memory of the analyzer, there by allowing direct measurements without the need for any further corrections. The unit was configured to run in modulated continuous transmit mode, while being supplied with typical data from an internal source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 20 MHz, with measurements from a peak detector presented in the chart below.

8.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4446A	US45300564	9 kHz-44GHz

8.3 Test Data

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
11	2405.000	+30 dBm	-1.461	31.461
18	2445.000	+30 dBm	-1.791	31.791
26	2480.000	+30 dBm	-1.809	31.809

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	(1) Calculated EIRP (dBm)	Conducted Power Limit (dBm)	EIRP Limit (dBm)
Lowest	2405	-1.461	-1.991	30.0	36.0
Middle	2445	-1.791	-2.291	30.0	36.0
Highest	2480	-1.809	-2.309	30.0	36.0

⁽¹⁾ EIRP Calculation:

EIRP = (Peak power at antenna terminal in dBm) + (EUT Antenna gain in dBi)



Measured RF Power Output (in Watts): 0.000632 W

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8.4 Screen Captures – Power Output (Conducted)







Prepared For: SaflokEUT: Messenger EMLS Research, LLCReport # 310025Model #: A28990LSR Job #: C-828Serial #:N/APage 35 of 55

Channel 26

🔆 Agil	ent a	21:34:2	6 Feb	15,203	10			ML1	0.400	00 CU-	Peak Search
Ref 10 Peak Lng	dBm		Atten	20 dB		1		MKLT	2.480 -1.80	20 GHZ 9 dBm	Meas Tools+
10 dB/						¢					Next Peak
	Mar	ker _									Next Pk Right
	2.4 1.	8020 809	10000 dBm	GHz					×*	han	Next Pk Left
M1 S2 S3 FC A AA											Min Search
											Pk-Pk Search
Center #Res B	2.48 (W 3 MH) GHz Iz		VE	3W 3 MI	 Hz	Sv	veep 4	Span 2 ms (40	20 MHz 1 pts)	More 1 of 2

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EXHIBIT 9. POWER SPECTRAL DENSITY: 15.247(e)

9.1 Limits

For digitally modulate systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

In accordance with FCC Part 15.247(e) and RSS 210 A8.2(b), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed using the utility built into the Agilent Analyzer. The resultant density was then corrected to a 3 kHz bandwidth using the spectrum analyzer built-in function to correct to a 3 kHz measurement. The highest density was found to be no greater than -26.29 dBm, which is under the allowable limit by more than 34 dB.

9.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.
Spectrum Analyzer	Agilent	E4446A	US45300564

9.3 Test Data

Channel	Center Frequency (MHz)	Measured Channel Power (dBm/1 Hz)	3 kHz Correction (dB)	Corrected Power Measurement (dBm/3kHz)	Limit (dBm)	Margin (dB)
11	2405	-61.06	34.77	-26.29	+8.0	34.29
18	2445	-61.65	34.77	-26.88	+8.0	34.88
26	2480	-62.55	34.77	-27.78	+8.0	35.78

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EXHIBIT 10. SPURIOUS EMISSIONS: 15.247(d)

10.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

In addition, emissions, which fall in the restricted band, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(e)

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 – 167.17	2310 – 2390	9.3 – 9.5
0.49 – 0.51	167.72 – 173.2	2483.5 – 2500	10.6 – 12.7
2.1735 – 2.1905	240 – 285	2655 – 2900	13.25 – 13.4
8.362 - 8.366	322 – 335.4	3260 – 3267	14.47 – 14.5
13.36 – 13.41	399.9 – 410	3332 – 3339	14.35 – 16.2
25.5 - 25.67	608 – 614	3345.8 – 3358	17.7 – 21.4
37.5 – 38.25	960 – 1240	3600 – 4400	22.01 – 23.12
73 – 75.4	1300 – 1427	4500 – 5250	23.6 - 24.0
108 – 121.94	1435 – 1626.5	5350 – 5460	31.2 – 31.8
123 – 138	1660 – 1710	7250 – 7750	36.43 – 36.5
149.9 – 150.05	1718.8 – 1722.2	8025 - 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 - 9200	

FCC 47 CFR 15.205(a) – Restricted Frequency Bands

FCC 47 CFR 15.209(a) Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 – 1.705	24,000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Calculation of Radiated Emission Measurements

Frequency (MHz)	3 m Limit (μV/m)	3 m Limit (dBμV/m)	1 m Limit (dBµV/m)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-25,000	500	54.0	63.5

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FCC Part 15.247(d) and IC RSS 210 A8.5 requires a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable. The loss from the cable was loaded into the analyzer as gain offset settings, there by allowing direct readings of the measurements made without the need for any further corrections. An Agilent E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -35 dBc of the fundamental level for this product.

	Channel 11	Channel 18	Channel 26
Fundamental	-1.46 (dBm)	-1.79 (dBm)	-1.81 (dBm)
2 nd Harmonic	- 43.18 (dBm)	- 39.11 (dBm)	- 37.80 (dBm)
3 rd Harmonic	- 43.47 (dBm)	- 43.76 (dBm)	- 43.60 (dBm)
4 th Harmonic	- 60.20 (dBm)	- 62.24 (dBm)	- 60.90 (dBm)
5 th Harmonic	- 60.27 (dBm)	- 62.67 (dBm)	- 63.61 (dBm)
6 th Harmonic	Note (1)	Note (1)	Note (1)
7 th Harmonic	Note (1)	Note (1)	Note (1)
8 th Harmonic	Note (1)	Note (1)	Note (1)
9 th Harmonic	Note (1)	Note (1)	Note (1)
10 th Harmonic	Note (1)	Note (1)	Note (1)

Notes:

(1) Measurement at system noise floor.

10.2 Test Equipment List

Test Equipment	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Agilent	E4446A	US45300564	3 Hz to 44 GHz

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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Channel 18, shown from 30 MHz up to 300 MHz 🔆 Agilent 23:03:21 Feb 15, 2010 Display Mkr1 192.0 MHz Ref 0 dBm Atten 10 dB -44.54 dBm **Full Screen** Peak Log 10 Display Line -25.00 dBm dB/ Off 0n φ Limits⊦ M1 S2 al manager of the state of the \$3 FC A AA Title⊦ Start 30 MHz Preferences. Stop 300 MHz #Res BW 100 kHz #VBW 100 kHz Sweep 34.79 ms (401 pts)

10.3 Screen Captures – Spurious Radiated Emissions

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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₩ Agilent 23:05:30 Feb 15, 2010	Deals Coursel
Mkr1 305 MHz	Peak Search
Ref 0 dBm Atten 10 dB -47.44 dBm Peak Log	Meas Tools
10 dB/	Next Peak
Marker	Next Pk Right
> 305.000000 MHz →47.44 dBm	Next Pk Left
	Min Search
	Pk-Pk Search
Start 300 MHz Stop 1 GHz #Res BW 100 kHz #VBW 100 kHz Sweep 90.19 ms (401 pts)	More 1 of 2

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
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🔆 Agi	ilent ä	23:0	CI 6:2	nannel 0 Feb	18, sh 15, 201	ow 10	n f	rom 1	000 MI	Hz up	to 100	00 MHz	Trace/View
Ref Ø Peak Log	dBm			Atten 1	10 dB					M	lkr1 2. _6.70	.44 GHz 05 dBm	Trace <u>1</u> 2 3
10 dB/													Clear Write
	Mar	ke											Max Hold
	2.4	40 70	00 5	0000 dBm	GHz								Min Hold
M1 S2 S3 FC A AA	a		l.,	Marrow	°≁≁≁⊷stk _k _	, w ,	im		and and			-marile	View
													Blank
Start : #Res E	L 1 GHz 3W 100	kHz			#VB	W 1	00	kHz	Swe	ep 1.1	 	10 GHz 1 pts)	More 1 of 2

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 42 of 55

🔆 Agil	ent 2	23:07:3	3 Feb	15,20	10						Peak Search
Ref0 Peak Log	dBm		Atten	10 dB				Mk	r1 12. -63.1	21 GHz 1 dBm	Meas Tools•
10 dB/											Next Peak
	Mar	ker	0000								Next Pk Right
	12. -6.	2100 8.11 - <u>1</u>	dBm	U GH	z						Next Pk Left
M1 S2 S3 FC A AA	Maria	<u></u>	y mar an	·•••••	·····			m	www	·····	Min Search
											Pk-Pk Search
Start 1 #Res B	0 GHz W 100	kHz		I ₩VE	 3W 100	kHz	Swee	 p 1.933	Stop 2 3 s (40	25 GHz 1 pts)	More 1 of 2

Channel 18, shown from 10000 MHz up to 25000 MHz

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 43 of 55

EXHIBIT 11. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

The stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers. Power was supplied by an external bench-type variable power supply, and the frequency of operation was monitored using the spectrum analyzer,

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied.

	DC/AC Voltage Source					
	5.1 VDC	6.0 VDC	6.9 VDC			
Channel 11	2404.710000(MHz)	2404.790000(MHz)	2405.430000 (MHz)			
Channel 18	2445.660000(MHz)	2445.390000(MHz)	2445.550000 (MHz)			
Channel 26	2479.700000(MHz)	2479.980000(MHz)	2480.180000 (MHz)			

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=3 MHz setting while the voltage was varied.

	DC/AC Voltage Source					
	5.1 VDC	6.0 VDC	6.9 VDC			
Channel 11	-1.023(dBm)	-1.186(dBm)	-1.239 (dBm)			
Channel 18	-1.423(dBm)	-2.033(dBm)	-1.478 (dBm)			
Channel 26	-1.722(dBm)	-1.023(dBm)	-1.592 (dBm)			

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

No anomalies were noted, in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 44 of 55

APPENDIX A-Test Equipment List



Date	: <u>11-Mar-2010</u>	Type Test	Radiated Em	issions		Job #	C-828	
Prenared P	r	Customer	Saflok			Quote #	310025	
Prepared by	/	Customer .	Sallon				510025	
o. Asset#	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status	
EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration	
EE 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration	
AA 960150	Bicon Antenna	ETS	2090 3110B	40900	11/3/2009	11/3/2010	Active Calibration	
AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration	
AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration	
EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	12/28/2009	12/28/2010	Active Calibration	
EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/17/2009	9/17/2010	Active Calibration	
LS RE Wireler Equ	ESEARCH LLC ss Product Development ipment Calibration							
Date	: 11-Mar-2010	Type Test	Occupied Ba	ndwidth (6dB & 20dE	3)	Job # :	<u>C-828</u>	
Prepared By	y: Peter	Customer :	Saflok			Quote #	310025	
. Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status	
EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/17/2009	9/17/2010	Active Calibration	
Wireles Equ Date	ss Product Development ipment Calibration : <u>11-Mar-2010</u>	Type Test	Band-Edge			Job # :	<u>C-828</u>	
Prepared By	y: Peter	Customer :	Saflok			Quote #	310025	
. Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status	
EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration	
EE 960157 EE 960158	3Hz-13.2GHz Spectrum Analyzer RF Preselecter	Agilent Agilent	E4445A N9039A	MY48250225 MY46520110	3/17/2009 7/2/2009	3/17/2010 7/2/2010	Active Calibration Active Calibration	
EE 960157 EE 960158 EE 960130	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller	Agilent Agilent ETS	E4445A N9039A 2090	MY48250225 MY46520110 45968	3/17/2009 7/2/2009 XXX	3/17/2010 7/2/2010 XXX	Active Calibration Active Calibration Cal Not Required	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp	Agilent Agilent ETS EMCO Adv. Micro	E4445A N9039A 2090 93146 WLA612	MY48250225 MY46520110 45968 9701-4855 123101	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147 EE 960147 ELS RE Uvireles Equi	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration	Agilent Agilent ETS EMCO Adv. Micro	E4445A N9039A 2090 93146 WLA612	NY 48250225 NY 46520110 45968 9701-4855 123101	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147 EE 960147 Unreles Equi	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration : 11-Mar-2010	Agilent Agilent ETS EMCO Adv. Micro Type Test	E4445A N9039A 2090 93146 WLA612 Conducted P	MY 48250225 MY 48520110 45968 9701-4855 123101	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010 Job #	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration	
EE 960157 EE 960158 EE 960130 AA 980078 EE 960147	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development ipment Calibration :: 11-Mar-2010 :: Peter	Aglient Aglient ETS EMCO Adv. Micro Type Test	E4445A N9039A 2090 93146 WLA612 Conducted P Saflok	MY 48250225 MY 46520110 45968 9701-4855 123101 ower Output	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010 Job # Quote #	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025	
EE 960157 EE 960158 EE 960130 AA 980078 EE 960147	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development ipment Calibration :: 11-Mar-2010 :: Peter Description	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer	E445A N9039A 2090 93146 WLA612 Conducted P Saflok	MY48250225 MY46520110 45968 9701-4855 123101 ower Output	3/17/2009 7/2/2009 XOX 10/18/2009 12/28/2009 12/28/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010 12/28/2010 Job # Quote #	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development ipment Calibration : 11-Mar-2010 // Peter Description Spectrum Analyzer	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent	E445A N9039A 2090 93146 WLA612 Conducted P Saflok Model # E4446A	MY48250225 MY46520110 45968 9701-4855 123101 ower Output Serial # US45300564	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 12/28/2009 Cal Date 9/17/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 12/28/2010 Job # Quote # Cal Due Date 9/17/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147 LS RI Equidant Date Prepared By . Asset # EE 960073 LS RI Equidant ES 960073	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development ipment Calibration :: 11-Mar-2010 :: Peter ESEARCH LLC ss Product Development ipment Calibration :: 11-Mar-2010	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Spurious Em	MY48250225 MY46520110 45968 9701-4855 123101 ower Output Serial # US45300564	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/28/2009 2/17/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 Job # Quote # Quote # Job #	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration	
EE 960157 EE 960157 EE 960130 AA 960078 EE 960147 LS RE Prepared By A Asset # EE 960073 LS RE Wirele: EE 960073 LS RE Wirele: EE 960073 LS RE Wirele: EE 960073 LS RE Wirele: EE 960073	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development igment Calibration *: 11-Mar-2010 /r Description Spectrum Analyzer ESEARCH LLC sproduct Development igment Calibration spectrum Analyzer ESEARCH LLC sproduct Development igment Calibration :: 11-Mar-2010 /r :: 11-Mar-2010	Aglient Aglient ETS EMCO Adv. Micro Type Test Customer : Aglient Type Test Customer : Customer :	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok Saflok	MY48250225 MY48520110 45968 9701-4855 123101 ower Output Serial # US45300564 issions	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/28/2009 2/17/2009	3/17/2010 7/2/2010 XXX 10/16/2010 12/28/2010 2/28/2000 2/2000 2/28/2000 2/2000 2/2000 2/2000 2/2	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025	
EE 960157 EE 960158 EE 960158 EE 960130 AA 960078 EE 960147 Virele: Equidation Date Prepared By A Asset # EE 960073 Virele: Equidation Date Prepared By A Asset #	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration : 11-Mar-2010 // Peter ESEARCH LLC SS Product Development ipment Calibration : 11-Mar-2010 // Peter Description	Aglient Aglient ETS EMCO Adv. Micro Type Test Customer : Manufacturer Aglient Type Test Customer : Manufacturer : Manufacturer	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok Saflok Model #	MY48250225 MY48520110 45968 9701-4855 123101 ower Output Serial # US45300564 issions	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/28/2009 9/17/2009 2/17/2009 Cal Date	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 2/28/2000 2/28/2000 2/28/2000 2/28/2000 2/2000 2/28/2000 2/2000 2/20000	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status C-828 310025 Equipment Status	
EE 960157 EE 960157 EE 960130 AA 960078 EE 960147 Virele: Equidador Date Prepared By LS REG Virele: EE 960073 LS REG Virele: EE 960073 Date Prepared By LAsset # EE 960157	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 r: Peter ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 r: Peter Description :: 11-Mar-2010 r: Peter Description :: 11-Mar-2010 r: Peter	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent Type Test Customer : Manufacturer Agilent	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok Saflok Model # E4445A E4445A	MY48250225 MY48520110 45968 9701-4855 123101 ower Output Serial # US45300564 issions Serial # MY48250225	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/28/2009 2/17/2009 2/17/2009 Cal Date 3/17/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 12/28/2010 2005 # Quote # Gal Due Date 3/17/2010 3/17/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status C-828 310025 Equipment Status Active Calibration	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development igment Calibration :: 11-Mar-2010 :: Peter Description Spectrum Analyzer ESEARCH LLC Ss Product Development igment Calibration :: 11-Mar-2010 :: 11-Mar-2010	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent Customer : Manufacturer Agilent Customer :	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok Saflok Model # E4445A N9039A 2000	MY48250225 MY46520110 45968 9701-4855 123101 ower Output Serial # US45300564 US45300564 issions	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/28/2009 2/17/2009 2/17/2009 2/17/2009 2/17/2009 2/2/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 2/28/2010 2/28/2010 4/17/2010 4/17/2010 7/2/2010 7/2/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025 Equipment Status Active Calibration C-828 C	
EE 960157 EE 960157 EE 960147 EE 960147 EE 960147 EE 960147 Date Prepared By Aaset # EE 960073 EE 960173 EE 960157 EE 960157 EE 960157 EE 960130 Aage(157) EE 960130	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC ss Product Development ipment Calibration Spectrum Analyzer ESEARCH LLC ss Product Development ipment Calibration :: 11-Mar-2010 :: 11-Mar-2010 :: Peter Description 3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Biron Anteona	Aglient Aglient ETS EMCO Adv. Micro Type Test Customer : Manufacturer Aglient Type Test Customer : Manufacturer Aglient ETS ETS	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok E4446A Model # E4445A N9039A 2090 3110B	MY 48250225 MY 46520110 45968 9701-4855 123101 ower Output Serial # US45300564 US45300564 issions Serial # MY 48250225 MY 46520110 45968 0003.3246	3/17/2009 7/2/2009 XOX 10/16/2009 12/28/2009 12/28/2009 2/28/2009 9/17/2009 9/17/2009 3/17/2009 7/2/2009 XOX 11/2/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 2/28/2010 2/28/2010 2/28/2010 2/27/2010 3/17/2010 7/2/2010 XOX 110/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025 Equipment Status Active Calibration Active Calibration Cal Not Required Active Calibration Cal Not Required	
EE 960157 EE 960157 EE 960130 AA 960078 EE 960147 Voir Else Prepared By Aasset # EE 960073 Voir Else Prepared By Aasset # EE 960073 Date Prepared By Date Prepared By Aasset # EE 960157 EE 960150 AA 960150 AA 960150 AA 960150 AA 960150	3Hz-13.20Hz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development igment Calibration Spectrum Analyzer ESEARCH LLC SS Product Development igment Calibration Spectrum Analyzer ESEARCH LLC SS Product Development igment Calibration :: 11-Mar-2010 // Peter Description 3Hz-13.20Hz Spectrum Analyzer RF Preselecter Muti-Device Controller Bicon Antenna Lon Periotic Antenna	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent Type Test Customer : Manufacturer Agilent ETS ETS ETS ENCO	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok E4446A Saflok E4446A E4446A Saflok E4445A N9039A 2090 3110B 93146	MY48250225 MY48520110 45968 9701-4855 123101 Serial # US45300564 US45300564 US45300564 MY48250225 MY48250225 MY48250225 MY46520110 45968 0003-3346 9701-4855	3/17/2009 7/2/2009 XOX 10/16/2009 12/28/2009 22/28/2009 22/28/2009 2/17/2009 2/17/2009 XOX 11/3/2009 XOX	3/17/2010 7/2/2010 XXX Job # Quote # Cal Due Date 9/17/2010 3/17/2010 XXX 11/2/2010 XXX	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025 Equipment Status Active Calibration Active Calibration Cal Not Required	
EE 960157 EE 960158 EE 960130 AA 960078 EE 960147	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 /: Peter ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 /: Peter Description Spectrum Analyzer ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 /: Peter Description 3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Bicon Antenna Log Periodic Antenna	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent Customer : Manufacturer Agilent ETS ETS EMCO EMCO	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A E4446A Saflok E4446A Model # E4445A N9039A 2090 31110B 93146 3115	MY48250225 MY48520110 45968 9701-4855 123101 Serial # US45300564 US45300564 US45300564 MY48250225 MY48250210 45968 0003-3346 9701-4855 6907	3/17/2009 7/2/2009 XOX 10/16/2009 12/28/2009 2/28/2009 2/17/2009 2/17/2009 7/2/2009 7/2/2009 XOX 11/3/2009 10/16/2009 12/22/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 2/28/2010 2/28/2010 2/28/2010 2/28/2010 2/28/2010 2/28/2010 3/17/2010 7/2/2010 XOX 11/3/2010 10/16/2010 12/22/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025 Equipment Status Active Calibration Active Calib	
E 960157 EE 960158 EE 960130 AA 960078 EE 960147 IS RE E 960147 IS RE E 960178 IS RE E 960073 IS RE E 960073 IS RE E 960073 Date Prepared By Date Prepared By 2. [Asset #] EE 960157 EE 960157 EE 960157 EE 960150 AA 960150 AA 960078 AA 960078	3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Log Periodic Antenna Pre-Amp ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 r: Peter ESEARCH LLC SS Product Development ipment Calibration :: 11-Mar-2010 r: Peter Description 3Hz-13.2GHz Spectrum Analyzer RF Preselecter Multi-Device Controller Bicon Antenna Log Periodic Antenna Double Ridge Horn Antenna Pre-Amp	Agilent Agilent ETS EMCO Adv. Micro Type Test Customer : Manufacturer Agilent Customer : Manufacturer Agilent ETS ETS ETS EMCO Adv. Micro	E445A N9039A 2090 93146 WLA612 Conducted P Saflok E4446A Saflok E4446A Saflok Model # E4445A N9039A 2090 3110B 93146 3115 WLA612	MY48250225 MY48520110 45968 9701-4855 123101 Serial # US45300564 US45300564 MY48250225 MY48520210 45968 0003-3346 9701-4855 6907 123101	3/17/2009 7/2/2009 XXX 10/16/2009 12/28/2009 2/28/2009 2/17/2009 2/17/2009 7/2/2009 7/2/2009 XXX 11/3/2009 10/16/2009 10/16/2009 12/28/2009	3/17/2010 7/2/2010 XOX 10/16/2010 12/28/2010 2/28/2010 4 Cal Due Date 3/17/2010 7/2/2010 XX2 11/3/2010 10/16/2010 12/28/2010	Active Calibration Active Calibration Cal Not Required Active Calibration Active Calibration C-828 310025 Equipment Status Active Calibration C-828 310025 Equipment Status Active Calibration Active Calib	

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 45 of 55

Ŷ	S RESEARCH LLC Wireless Product Development Equipment Calibration
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	Date :	11-Mar-2010	Type Test :	Radiated Emissio	ns (109)		Job # :	C-828
	Prepared By:	Peter	Customer :	Saflok			Quote #:	310025
N	o. Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	3/17/2009	3/17/2010	Active Calibration
2	EE 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration
3	EE 960130	Multi-Device Controller	ETS	2090	45968	XXXX	XXX	Cal Not Required
4	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration
5	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration
6	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	12/22/2009	12/22/2010	Active Calibration
- 7	EE 960147	Pre-Amp	Adv. Micro	WLA612	123101	12/28/2009	12/28/2010	Active Calibration
	LS RE Wireless Equi	SEARCH LLC Product Development pment Calibration						
	Date :	11-Mar-2010	Type Test :	Power Spectral D	ensity		Job # :	<u>C-828</u>
	Prepared By:	Peter	Customer :	Saflok			Quote #:	310025
N	o. Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/17/2009	9/17/2010	Active Calibration

Prepared For: Saflok	EUT: Messenger EM	LS Research, LLC
Report # 310025	Model #: A28990	
LSR Job #: C-828	Serial #:N/A	Page 46 of 55

APPENDIX B-TEST STANDARDS – CURRENT PUBLICATION DATES

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2009		
ANSI C63.10	2009		
CISPR 11	2009-05	2009-12 P	
CISPR 12	2007-05		
CISPR 14-1	2005-11	2008-11	
CISPR 14-2	2001-11	2001-11	2008-05
CISPR 16-1-1 Note 1	2010-01		
CISPR 16-1-2 Note 1	2003	2004-04	2006-07
CISPR 22	2008-09		
CISPR 24	1997-09	2001-07	2002-10
EN 55011	2007-05		
EN 55014-1	2006		
EN 55014-2	1997		
EN 55022	2006	2007	
EN 60601-1-2	2007-03		
EN 61000-3-2	2006-05		
EN 61000-3-3	2008-12		
EN 61000-4-2	2009-05		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2009-05		
EN 61000-4-8	1994	2001	
EN 61000-4-11	2004-10		
EN 61000-6-1	2007-02		
EN 61000-6-2	2005-12		
EN 61000-6-3	2007-02		
EN 61000-6-4	2007-02		
FCC 47 CFR, Parts 0-15,	2009		
FCC Public Notice DA 00- 1407	2000		
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2009-08		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	2009-02
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
		incl in	2009-12
IEC 61000-4-3	2008-04	2008-04	FD

STANDARD #	DATE	Am. 1	Am. 2
IEC 61000-4-4	2004-07	2010-10	
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-10		
IEC 61000-4-8	2009-09		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14982	1998-07		
MIL Std. 461E	1999-08		
RSS GEN	2007-06		
RSS 119	2007-06		
RSS 123	1999-11		
RSS 125	2000-03		
RSS 131	2003-07		
RSS 136	2002-10		
RSS 137	2009-02		
RSS 210	2007-06		
RSS 213	2005-12		
RSS 243	2005-11		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation. Updated on 02-03-10 P=Project FD= Final Draft

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APPENDIX C- Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

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Appendix D

Justifications of Average Duty Factor Calculations

Average (Relaxation) Factor

Average Factor = 20* Log₁₀ (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies up to 2.8 ms of time, within any 5 ms window, with a period of 62ms. Therefore, the relaxation factor allowance is calculated as:

Average Factor = $20^* \text{Log}_{10} (2(1.4) / 62 \text{ ms}) = 26$

A relaxation factor of 26 dB would be allowable for this product.



Figure 1: Demonstration of period between transmissions as 62 ms.

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Figure 2: Plot demonstrating one transmission as seen in figure 1. Figure 2 gives better resolution to show exact on time for one transmission, as compared to figure 1.

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<u>Appendix E</u>

Antenna Data Sheet

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2.4 GHz WLAN, Home RF, Bluetooth Antenna

NEW with Ground Clearance Requirements Minimized

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P/N 2450AT43B100

Detail Specification: 09/04/08

General Specifications

2450AT43B100	
2400 - 2500 Mhz	
1.3 dBi typ. (XZ-V)	
-0.5 dBi typ. (XZ-V)	
9.5 dB min.	
	2450AT43B100 2400 - 2500 Mhz 1.3 dBi typ. (XZ-V) -0.5 dBi typ. (XZ-V) 9.5 dB min.

Input Power	2W max.
Impedance	50 Ω
Reel Quanity	1,000
Operating Temperature	-40 to +85°C
Storage Temperature	+5 to +35°C, Humidity: 45-75%RH, 12 mos. Max

	Packaging	Bulk	Suffix = S	Eg. 2450AT43B100S
P/N	Style	T&R	Suffix = E	Eg. 2450AT43B100E
Suffix	Termination	100% Tin	Suffix = None	Eg. 2450AT43B100(E or S)
	Style Tin / Lead	Please consult Factory		

Mechanical Dimensions

	In	mm	L
L	0.276 ± 0.008	7.00 ± 0.20	
W	0.079 ± 0.008	2.00 ± 0.20	W
L1	0.102 ± 0.008	2.60 ± 0.20	
W1	0.020 ± 0.008	0.50 ± 0.20	
т	0.079 +.004/008	2.00 +0.1/-0.2	
а	0.020 ± 0.012	0.50 ± 0.30	L1 W1



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Typical Electrical Characteristics (T=25°C) Test Board: Antenna 10 Ground 20 • • • • No Ground 0 .. 0 0 40 Return Loss With Matching Circuit 0 -5 m 1 m2 (((^{-10.} ())) ((¹)) (¹)) (¹))) m 1 freq = 2.380GHz dB(S(1,1)) =-10.151 -15 m2 freq = 2.580GHz dB(S(1,1)) =-10.246 m3 -20 freq = 2.470GHz dB(S(1,1)) =-23.976 -25-2.2 2.4 2.6 2.0 2.8 3.0 freq, GHz

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