



ELECTROMAGNETIC COMPATIBILITY (EMC) REPORT

EMISSIONS

Elica s.p.a

Model 2009B
FCC ID: TMQRFT01

August 16, 2005

Project No.: 05CA31756

Test Report No.: MC8339-081605

REPORT DIRECTORY

<u>Title</u>	<u>Section</u>
General Information.....	1.0
Scope.....	1.1
Purpose.....	1.2
Test Results.....	1.3
Documentation Review/Approval.....	1.4
General Product Description.....	2.0
Justification of Configuration.....	2.1
EUT Operating Mode(s).....	2.2
Environmental Conditions in Test Lab.....	3.0
Calibration Details of Equipment Used for Measurement.....	4.0
Test Facility.....	5.0
Accreditations and Authorizations.....	6.0
Emissions Test Regulations.....	7.0
Field Strength Calculations.....	7.1
Measurement Uncertainty.....	7.2
Measurement Bandwidths.....	7.3
Transmit Deactivation Time.....	7.4
Radiated Electric Field Spurious Emissions.....	7.5
Radiated Electric Field Fundamental Emissions.....	7.6
Fundamental Duty Cycle.....	7.7
Occupied Bandwidth.....	7.8

1.0 General Information

1.1 Scope

Underwriters Laboratories Inc., authorizes the above named company to reproduce this Report, provided it is reproduced in its entirety. The data in this Report reflects only the items tested in the configurations and mode of operations described. All data recorded and photographs represents testing under the worst case conditions permitted by the requirements applied to the product. It is the manufacturer's responsibility to assure that additional production units are manufactured with identical electrical and mechanical components. Any modifications necessary for compliance made during testing must be implemented in all production units for compliance to be maintained.

Underwriters Laboratories Inc., shall have no liability for any deductions, inferences or generalizations drawn from this report. This report shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the United States government.

1.2 Purpose

Testing was performed to the following regulations:

Emissions Standards used: CFR 47 Part 15 Subpart C

Except as noted below, all test methods and data contained in this report are covered by NVLAP accreditation.

Exceptions:

None.

1.3 Test Results

☒ In Compliance

☐ Not in Compliance

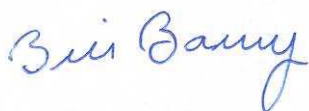
Statements regarding compliance with requirements and criteria in the subsequent sections of this report are opinions and interpretations provided by Underwriters Laboratories Inc. technical staff.

Transmitter Requirement Summary

Environmental Phenomena	Frequency Range	FCC Section	Test Result
Antenna Requirements	88 – 108 MHz	15.203	The unit is provided with an integral antenna
Conducted Emissions, AC Mains	0.15 – 30 MHz	15.207	Not Required (Battery Operated)
5 Second Transmit Time	433.9 MHz	15.231(a)(1)	See Section 7.4
Spurious Radiated Emissions	30 – 5000 MHz	15.209,15.231(b)	See Section 7.5
Fundamental Emissions	433.9 MHz	15.231(b)	See Section 7.6
Occupied Bandwidth 20 dB	433.9 MHz	15.231(c)	See Section 7.8

1.4 Documentation Review/Approval

Project Management:



Bill Barry
Staff Engineer
International EMC Services
Department 3014A

Technical Review By:



Asim Tirmizi
Project Engineer
International EMC Services
Department 3014A

2.0 General Product Description

Applicant	: Elica Spa
Manufactured By	: Same as Applicant
License Holder	: Not Applicable
Applicant Address	: Via Dante 288 Fabriano, AN 60044 ITALY
Applicant Contact	: Luca David
Model/Type No.	: 2009B
Date of Issue	: August 16, 2005
File No.	: MC8339
Test Report No.	: MC8339-0801605
Project No.	: 05CA31756

Product Description

The EUT is a 433.9 MHz manually activated remote control transmitter. The device is intended to control an overhead cooking range light and fan.

Equipment Size, Mobility, and Identification

Dimensions: 46 by 46 by 80 mm

Mobility: ☐ Hand-held ☒ Table-top ☐ Floor-standing ☐ Rack Mount

Electrical Ratings

	<u>Voltage</u> <u>[Volts]</u>	<u>Current or</u> <u>Power</u>	<u>Frequency</u> <u>[Hz]</u>	<u>Phase</u>
Eut	6 V	Not provided	DC	NA

Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

<u>Voltage</u>	<u>Frequency</u>
6 V	DC

Clocks/Oscillators

4 MHz, 433.9 MHz

Equipment Type

☐ Prototype ☐ Pre-Production ☒ Production

Model Differences

Any other model(s) represented by the models tested in this investigation will be documented by the manufacturer.

Device Modifications

The following modifications were necessary for compliance: None

EUT

Description	Manufacturer	Model/Part #	Serial Number
Remote Control	Elica	2009B	Not provided

2.1 Justification of Configuration

The EUT is provided in one configuration.

2.2 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

The transmitter was powered from a fresh battery. For all testing except spurious emissions and fundamental emissions, the transmitter was manually operated to generate its RF signal. For all other tests, the transmitter was modified to allow continuous transmission. Fundamental measurements were made before and after the continuous transmission tests to verify the battery did not deplete. Since the unit is intended to be used on a countertop, only one orientation was tested.

3.0 Environmental Conditions in Test Lab

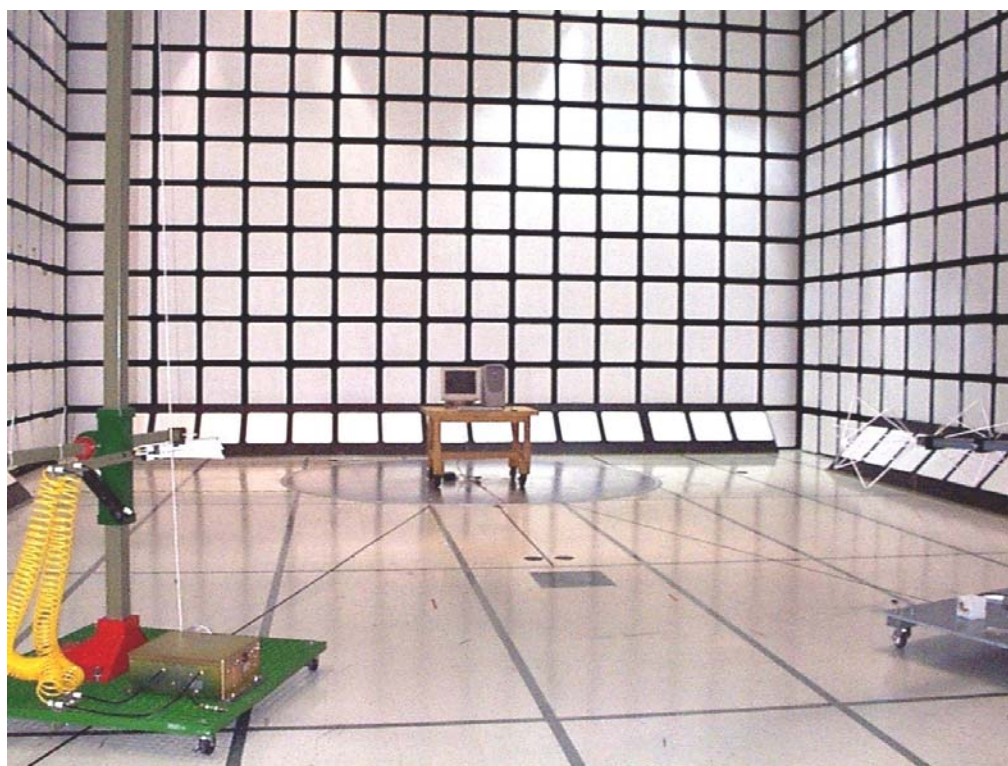
Temperature: 20-25 °C Atmospheric Pressure: 680-1060 mbar
Relative Humidity: 30-60% 20.1-31.3 in. Hga

4.0 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or as recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST), therefore, all test data recorded in this report is traceable to NIST.

5.0 Test Facility

Underwriters Laboratories Inc.
1655 Scott Blvd.
Santa Clara, CA 95050
Phone: (408) 876-2905 Fax: (408) 556-6071



6.0 Accreditations and Authorizations



NVLAP Lab code: 200252-0

NVLAP: Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. The specific scope includes IEC/CISPR 22:1997, Amendment 1:1995, Amendment 2:1997, EN 55022:1998, AS/NZS 1044, CNS 13438:1997, ANSI C63.4, FCC Method - 47 CFR Part 15 Subparts B-E, AS/NZS 3548, AS/NZS CISPR 22, CISPR 14-1, EN 55014-1, CNS 13783-1, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, EN/IEC 61000-3-2, EN/IEC 61000-3-3, AS/NZS 4268, AS 4268.1, AS 4268-2, AS 4771, LP0002, DGT RTTE01, RSS-112, RSS-117, RSS-118, RSS-119, RSS-123, RSS-125, RSS-128, RSS-129, RSS-130, RSS-131, RSS-132, RSS-133, RSS-134, RSS-135, RSS-136, RSS-137, RSS-139, RSS-141, RSS-142, RSS-170, RSS-181, RSS-182, RSS-187, RSS-188, RSS-191, RSS-192, RSS-193, RSS-210, RSS-212, RSS-213, RSS-215, GR-1089-CORE, SBC-TP-76200 Issue 4, and GR-63-CORE testing.



FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland and accepted in a letter dated September 24, 1997 (Ref. No. 31040/SIT 1300F2).



Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3.
File #: IC 2704



VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8.
Registration Nos.: (Radiated Emissions) R-672, (Conducted Emissions) C-689.



ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).



NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.

NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).

NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6.
U.S. Identifier Number: US0114

7.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

----- United States -----

CFR 47 Part 15 Subpart C : 2005 Code of Federal Regulations, Part 15, Subpart C, Radio Frequency Devices -
Intentional Radiators

7.1 Field Strength Calculations

The field strength is calculated by adding the Transducer Factor (Antenna Factor) and Gain/Loss (Cable Loss, Preamp Gain) Factor to the Meter Reading. The basic equation with a sample calculation is as follows:

Field Strength = Meter Reading + Transducer Factor + Gain/Loss

Assume a receiver reading of 53.2 dBuV is obtained. The Transducer Factor of 5.1 dB and a Gain/Loss of -31 dB is added, giving a field strength of 27.3 dBuV.

$$FS = 53.2 + 5.1 + (-31) = 27.3 \text{ dBuV}$$

Use the following formula to convert dBμV to μV: $x = 10^{(y/20)}$, where x is the value in μV and y is the value in dBμV.

$$\text{Level in uV} = 10^{(27.3/20)} = 23.2 \text{ uV}$$

7.2 Measurement Uncertainty

When a measurement is made the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its “true” value.

Uncertainty (dB)

Test Distance	Probability Distribution	Biconical Antenna			Log Periodic Antenna		
		10m +18 deg	10m -14 deg	3m	10m +18 deg	10m -14 deg	3m
Combined Standard Uncertainty $u_c(y)$	Normal	± 1.24	± 1.25	± 1.29	± 1.14	± 1.13	± 1.9
Expanded uncertainty U (level of confidence = 95%)	Normal (k = 2)	± 2.47	± 2.49	± 2.59	± 2.28	± 2.27	± 2.76

Conducted Voltage Emissions	Probability Distribution
Combined Standard Uncertainty $u_c(y)$	Normal
Expanded uncertainty U (level of confidence = 95%)	Normal (k = 2)
	± 1.08
	± 2.16

$u_c(y)$ = square root of the sum of squares of the individual standard deviation uncertainties.

U = combined standard uncertainty multiplied by the coverage factor: k. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required then k=3 (CL=97%) can be used.

“ISO Guide to the Expression of Uncertainty in Measurements” and ‘NIS81: The Treatment of Uncertainty in EMC Measurements” were the basis for determining the uncertainty levels of our measurements. Details of those calculations are available upon request.

7.3 Measurement Bandwidths

Frequency Range (MHz)	Peak Data BW (kHz)	Quasi-Peak Data BW (kHz)	Average Data BW (kHz)
0.01 - 0.15	1	3	0.2
0.15 - 30	10	9	100
30 - 1000	100	120	120
Above 1000	1000	N/A	1000

7.4 Transmit Deactivation Time

Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Date Tested: August 5, 2005

Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Spectrum Analyzer	Hewlett-Packard	8572A	8228	6/25/2004	8/30/2005

Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006

UL Procedure

The EUT was activated manually while measuring the fundamental on a spectrum analyzer set to zero span. The time it took for the transmitter to de-energize after manual activation was ceased was recorded. The maximum time allowed to de-energize the transmitter is 5 seconds.

Frequency Range of Measurement

433 MHz

Measurement Distance

3 meters

Test Results

The unit uses a non-latching input when activating its switches. The pulse transmission is sent once with each switch closure and ceases immediately. Holding a switch closed does not result in continuous transmission

The requirements are:

MET

Remarks

None.

7.5 Radiated Electric Field Spurious Emissions

Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Date Tested: August 8, 2005

Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Spectrum Analyzer	Hewlett-Packard	8572A	8228	6/25/2004	8/30/2005

Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006

UL Procedure

3314-LPG-013

Frequency Range of Measurement

30 MHz to 5 GHz

Measurement Distance

3 meters

Test Results

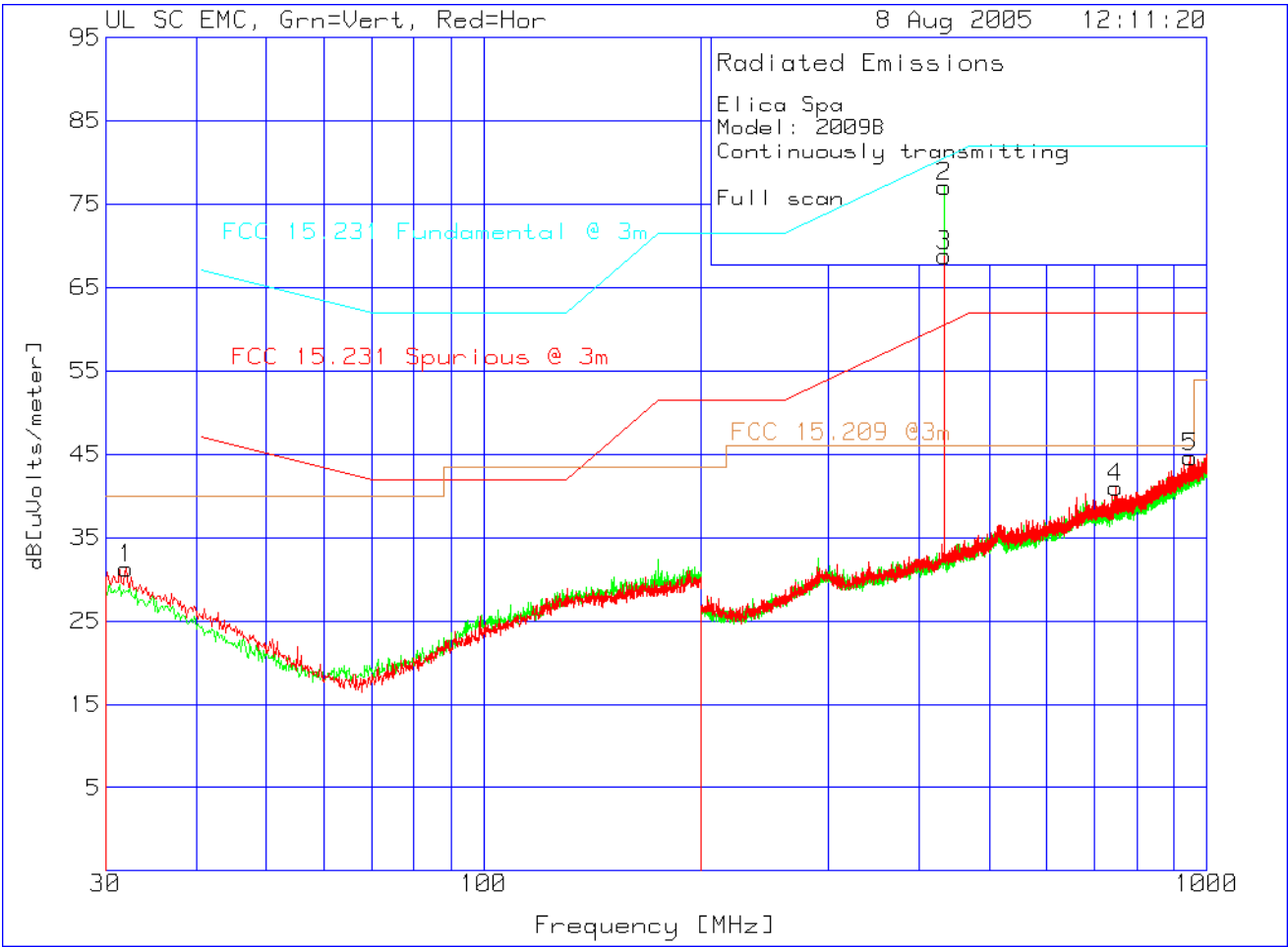
The requirements are:

MET minimum margin is 1.4 dB at 949.6 MHz.

Remarks

None.

Test Data



Company: Elica s.p.a.
Project: 05CA31756

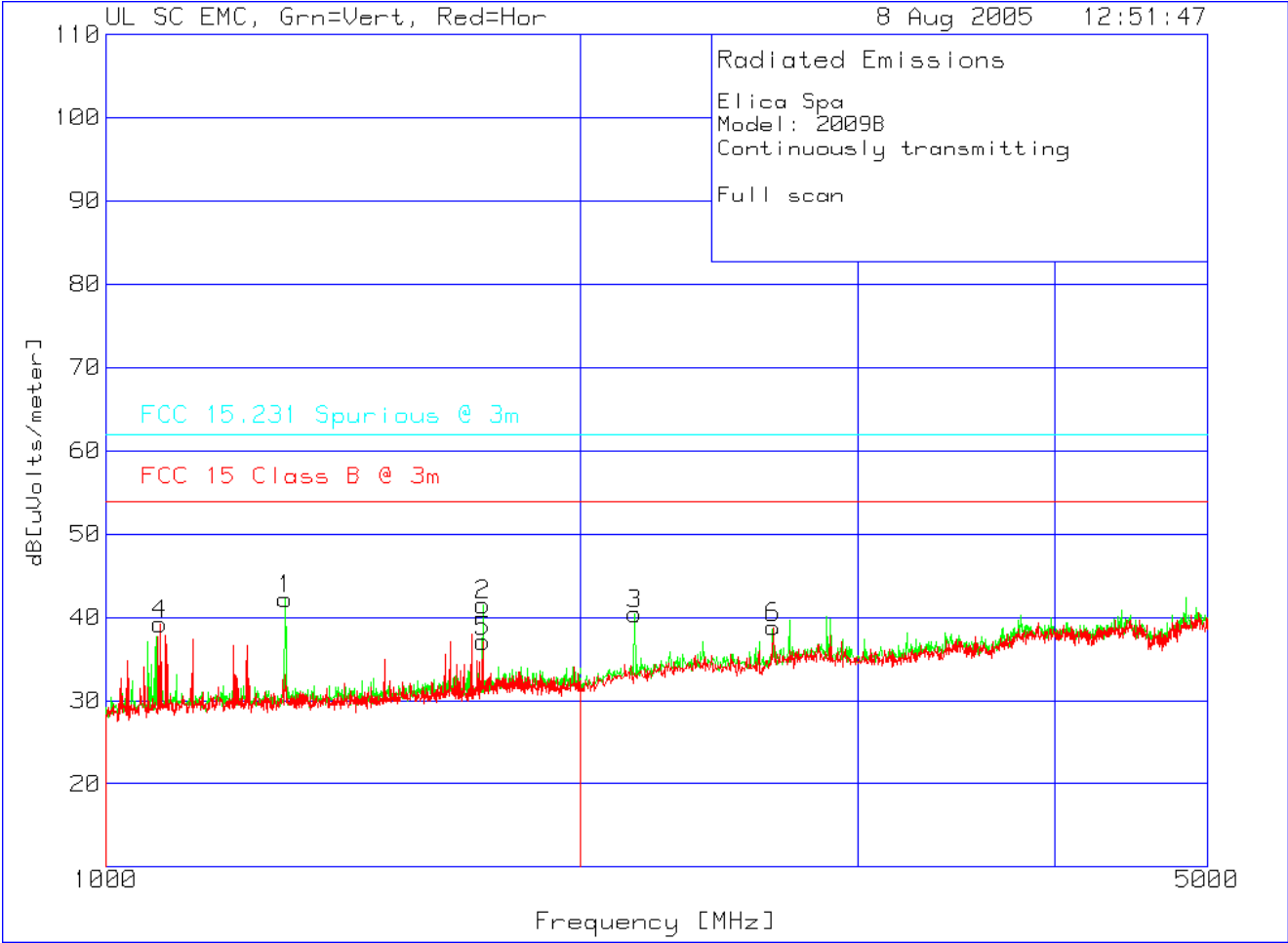
Model #:2009B
FCC ID: TMQRFT01
Report #:MC8339-081605

Elica Spa
Model: 2009B
Continuously transmitting
Full scan

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3
=====								
Range: 2 30 - 200MHz -----								
1	32.04	44.1 pk	-30.9	18.1	31.3	0	0	40
	Azimuth:181	Height:199	Horz	Margin [dB]		31.3	31.3	-8.7
Range: 3 200 - 1000MHz -----								
2	433.6248	88.1 pk	-27.1	16.1	77.1	60.5	80.5	46
	Azimuth:201	Height:102	Vert	Margin [dB]		16.6	-3.4	31.1
Range: 4 200 - 1000MHz -----								
3	433.6248	79 pk	-27.1	16.9	68.8	60.5	80.5	46
	Azimuth:108	Height:100	Horz	Margin [dB]		8.3	-11.7	22.8
4	748.3887	45 pk	-25.6	21.6	41	61.9	81.9	46
	Azimuth:46	Height:400	Horz	Margin [dB]		-20.9	-40.9	-5
5	949.6377	44.9 pk	-23.8	23.5	44.6	61.9	81.9	46
	Azimuth:358	Height:100	Horz	Margin [dB]		-17.3	-37.3	-1.4

LIMIT 1: FCC 15.231 Spurious @ 3m
LIMIT 2: FCC 15.231 Fundamental @ 3m
LIMIT 3: FCC 15.209 @3m

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector



Company: Elica s.p.a.
Project: 05CA31756

Model #:2009B
FCC ID: TMQRFT01
Report #:MC8339-081605

Elica Spa
Model: 2009B
Continuously transmitting
Full scan

No.	Test Frequency [MHz]	Meter Reading [dB (uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
Range: 1 1000 - 2000MHz -----							
1	1300	57.3 pk	-39.8	24.7	42.2	54	61.9
	Azimuth:349	Height:101 Vert		Margin [dB]		-11.8	-19.7
2	1734	54.6 pk	-39.3	26.2	41.5	54	61.9
	Azimuth:293	Height:101 Vert		Margin [dB]		-12.5	-20.4
Range: 2 2000 - 5000MHz -----							
3	2165	51.1 pk	-38.4	27.7	40.4	54	61.9
	Azimuth:245	Height:149 Vert		Margin [dB]		-13.6	-21.5
Range: 3 1000 - 2000MHz -----							
4	1082	54.7 pk	-39.7	24.2	39.2	54	61.9
	Azimuth:50	Height:101 Horz		Margin [dB]		-14.8	-22.7
5	1734	50.3 pk	-39.3	26.1	37.1	54	61.9
	Azimuth:305	Height:199 Horz		Margin [dB]		-16.9	-24.8
Range: 4 2000 - 5000MHz -----							
6	2651	47.4 pk	-37.5	28.9	38.8	54	61.9
	Azimuth:324	Height:101 Horz		Margin [dB]		-15.2	-23.1

LIMIT 1: FCC 15 Class B @ 3m
LIMIT 2: FCC 15.231 Spurious @ 3m

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Photographs



7.6 Radiated Electric Field Fundamental Emissions

Test Location

Date Tested: 8-5-2005

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Spectrum Analyzer	Hewlett-Packard	8572A	8228	6/25/2004	8/30/2005

Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006

UL Procedure

3314-LPG-013

Frequency Range of Measurement

30 MHz to 1 GHz

Measurement Distance

3 meters

Test Results

The requirements are:

MET minimum margin is 8 dB at 433.9 MHz.

Remarks

The minimum margin is the maximized peak signal strength less the duty cycle reduction of 9.4 dB. Refer to Section 7.7 for the duty cycle adjustment details.

Test Data

Elica Spa
Model: 2009B

Fundamental Emissions

Test	Meter	Gain/Loss	Transducer	Level	Limit:1
Frequency	Reading	Factor	Factor	dB[uVolts/meter]	
[MHz]	[dB(uV)]	[dB]	[dB]		
=====					
Range: 3 200 - 1000MHz					
433.7317	61.5 pk	4.3	16.1	81.9	80.5
Azimuth: 214 Height:124 Vert			Margin [dB]:		1.4

LIMIT 1: FCC 15.231 Fundamental @ 3m

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

7.7 Fundamental Duty Cycle

Test Location

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Date Tested: 8-5-2005

Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Spectrum Analyzer	Hewlett-Packard	8572A	8228	6/25/2004	8/30/2005

Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006

UL Procedure

With transmitter operating continuously, a measurement is to be made on the spectrum analyzer set at zero span which shows the pulse train of the transmissions. The total "on" time is to be compared to the total time of one period of pulses to determine the duty cycle.

Frequency Range of Measurement

30 MHz to 1 GHz

Measurement Distance

3 meters

Test Results

Total time of pulse period: 43.1 ms

Total number of “on” pulsewidth 1: 3

Time of each “on” pulsewidth 1: 2.22 ms

Total “on” time of pulsewidth 1: 6.66 ms

Total number of “on” pulsewidth 2: 12

Time of each “on” pulsewidth 2: 0.66 ms

Total “on” time of pulsewidth 2: 7.92 ms

Total “on” time (sum of all pulsewidth totals): 14.58 ms

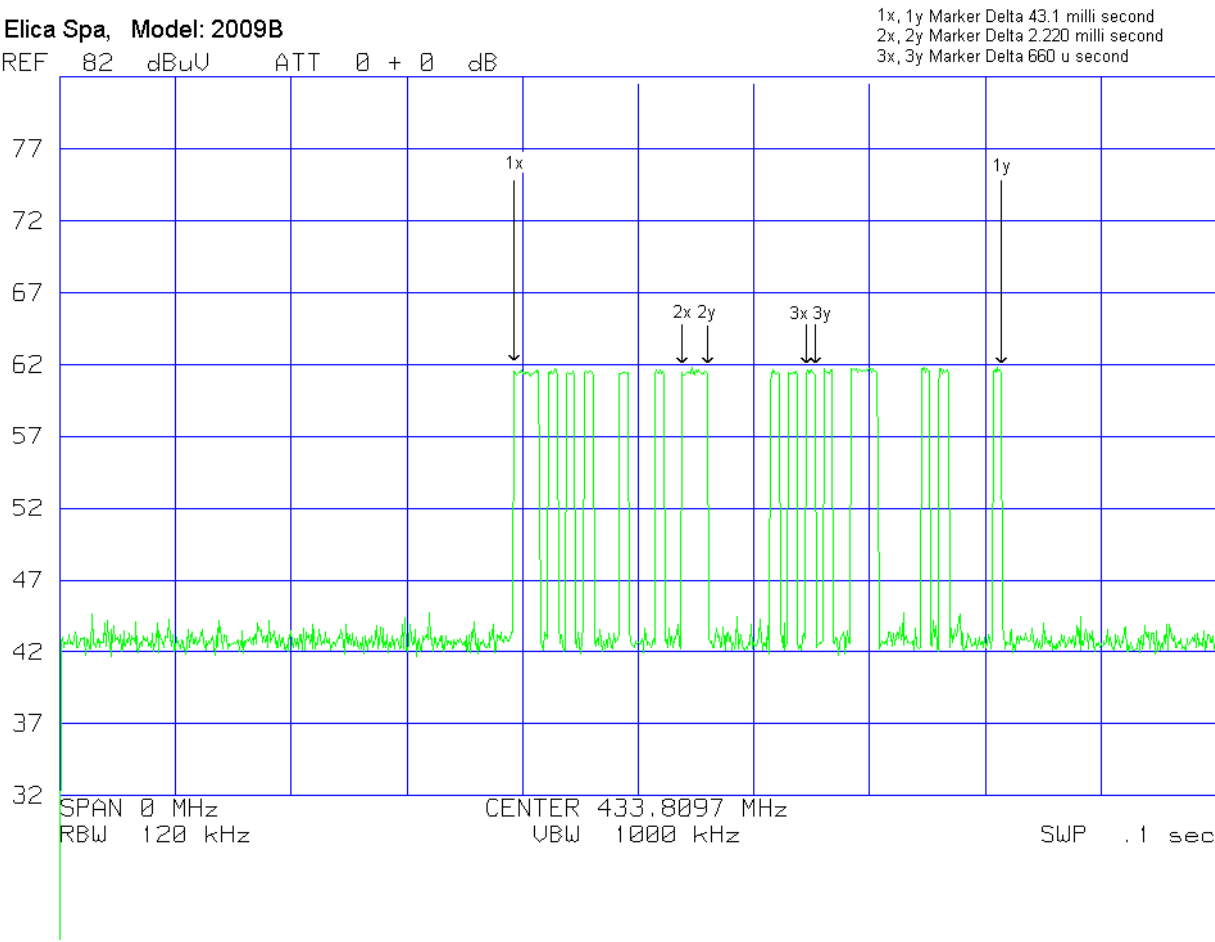
Duty Cycle (ratio of total on time to pulse period): 0.339

Duty Cycle in dB (20 log(duty cycle)): -9.4

Remarks

None.

Test Data



7.8 Occupied Bandwidth

Test Location

Date Tested: 8-5-2005

10 Meter Semi-Anechoic Chamber (Test Station 2) (Last NSA: 1/28/2005; Next NSA 1/28/2006)

Test Instruments

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Spectrum Analyzer	Hewlett-Packard	8572A	8228	6/25/2004	6/30/2005

Test Accessories

Instrument	Manufacturer	Model	ID#	Last	Cal
					Next
Biconical Antenna	Electro-Metrics	EM-6912A	8018	1/27/2005	1/27/2006
Log Periodic Antenna	Electro-Metrics	EM-6950	8017	1/31/2005	1/31/2006
Pre-amplifier	Sonoma Instruments	310N	8085	5/2/2005	5/2/2006

UL Procedure

With unit transmitting at 433.9 MHz, the spectrum analyzer is to be placed in a peak-hold mode centered around the 433.9 MHz fundamental. The span of the analyzer is to be large enough to encompass the entire fundamental. The marker on the peak of the envelope, the marker delta function is to be used. One side of the delta is moved 20 dB down from one side of the peak. The other side is to be moved 20 dB down to the other side of the peak. The bandwidth between the delta markers is to be recorded.

Frequency Range of Measurement

30 MHz to 1 GHz

Measurement Distance

3 meters

Test Results

Measured bandwidth is: 455 kHz

Maximum bandwidth allowed is 1.08 MHz

The requirements are:

MET

Remarks

None.

Test Data

