

Electrolux Home Products

Test Data
Permissive Changes II
User Interface with Transmitter

FCC ID: ABMELU81A

July 14, 2004



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1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is the Test Data for Permissive Changes II Certification.

1.2 Product Description

User Interface with Transmitter is a RF transmitter operating in 915MHz. The intended use of the *User Interface with Transmitter* is to generate and transmit a RF signal with freezer status data to receiver. *User Interface with Transmitter* powered at 5VDC.

Antenna Description:

On PCB mounted Cu wire antenna

Sample Submitted: April 8, 2004
Test Work Started: April 8, 2004
Test Work Completed: April 12, 2004

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2000. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

Radiated Emissions at fundamental and Harmonics Spurious Emissions were verified as antenna layout was changed from the original transmitter

2.2 EUT Setup

For simplicity of testing, the transmitter was wired to transmit continuously and tested with no plastic enclosure. The freezer Electronic Control Unit including the Power Supply (ECU) was assembled on the test fixture to provide data and 5VDC for the *User Interface with Transmitter*.

2.3 EUT Exercising Software

N/A

2.4 Special Accessories

There are no special accessories necessary for compliance of these products.

2.5 Equipment Modification

No modifications were installed during the testing.

2.6 Support Equipment List and Description

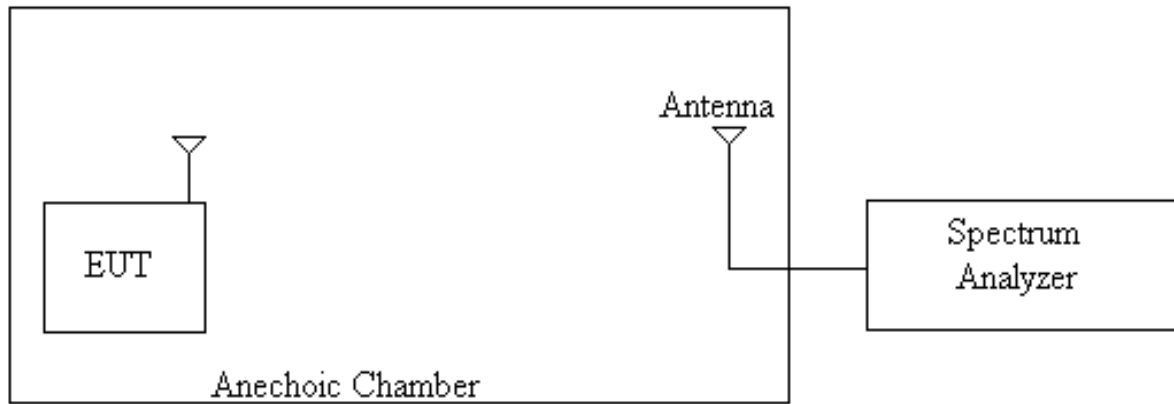
Freezer Electronic Control Unit including the Power Supply (ECU) assembled on the test fixture by Electrolux Home Products.

2.7 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.

The EUT was powered at 5VDC from the Electronic Control Unit Power Supply (ECU).

Field Strength Measurements



3.0 TEST RESULTS

3.1 Field Strength of Fundamental, FCC 15.249(a)

Field Strength of Fundamental at 914.99MHz.

The EUT complies with the Standard requirements for Fundamental Emissions with minimum margin 7.8dB for Fundamental Emissions.

The Table 3-1-1 shows the Field Strength of Fundamental Radiation.

Note: Correction Factor in the Table includes the Antenna Factor and Cable Loss.

Radiated Emissions of Fundamental
Date: 07-13-2004

Company: Electrolux Home Products
Model: User Interface with Transmitter
Test Engineer: Norman Shpilsher
Special Info:
Standard: FCC Part 15.249(a)
Test Site: 3m Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions
 All measurements were taken using a CISPR Quasi-peak detector

Table # 3-1-1

Frequency MHz	Antenna			QP reading dB μ V	Total QP dB μ V/m	QP Limit dB μ V/m	Margin dB	Comments
	Polarity	Hts(cm)	Factor(dB1/m)					
914.99	V	114	25.1	60.9	86.0	94.0	-8.0	
914.99	H	100	25.1	61.1	86.2	94.0	-7.8	

Comments:

3.2 Field Strength of Harmonics Emissions, FCC 15.249(a), 15.205

Field Strength of Harmonics Emissions measurements were made up to 10th harmonic.

The EUT complies with the Standard requirements for Harmonics Emissions with minimum margin 4.3dB.

The Table 3-2-1 and Graph 3-2-1 show the Field Strength Harmonics Emissions and spurious emissions from 1 to 10GHz

Note: Emission level shown on the Graph includes the Antenna Factor, Cable Loss; Pre-amplifier gain also included (for measurements above 1GHz). Total Factor in the Table includes all above factors.

Harmonics and Spurious Radiated Emissions from 1 to 10GHz

Date: 07-13-2004

Company: Electrolux Home Products
Model: User Interface with Transmitter
Test Engineer: Norman Shpilsher
Special Info:
Standard: FCC Part 15.249(a)
Test Site: 3m Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions
 All measurements were taken using a Peak detector

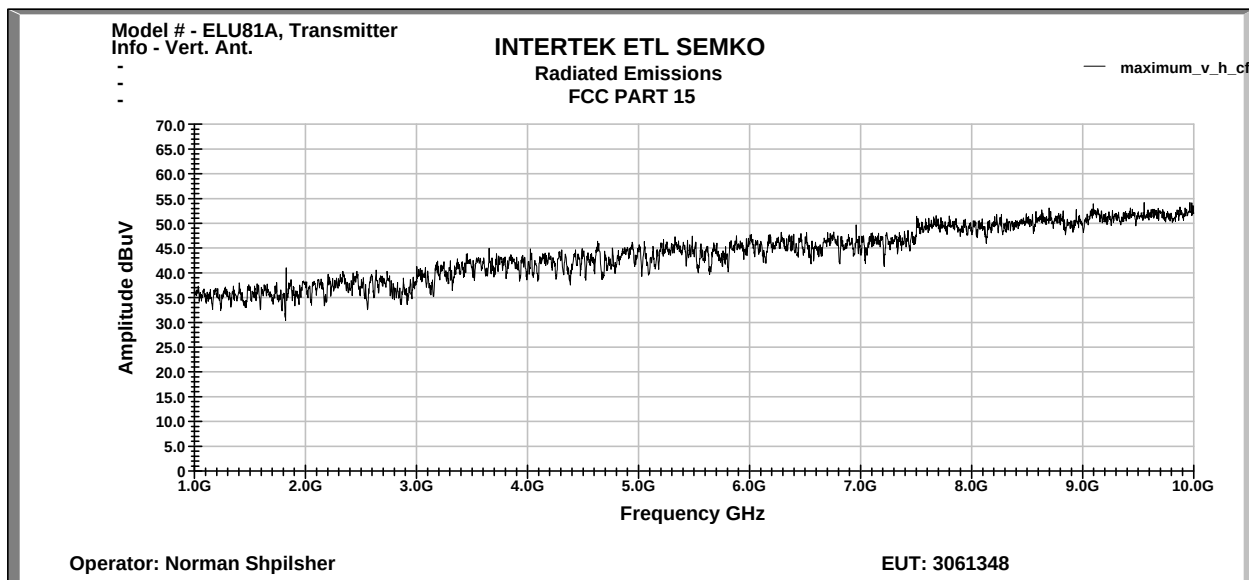
Table # 3-2-1

Frequency MHz	Antenna		Total Factor dB1/m	Peak reading dBμV	Total at 3m dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)						
1826.61	V	115	-4.4	45.4	41.0	54.0	-13.0	
3654.94	V	133	4.7	40.2	44.9	54.0	-9.1	
4630.90	V	100	7.4	39.0	46.4	54.0	-7.6	
6961.40	V	109	11.6	38.1	49.7	54.0	-4.3	
3418.03	H	119	3.6	40.0	43.6	54.0	-10.4	
4417.20	H	124	6.9	38.8	45.7	54.0	-8.3	
6688.41	H	100	10.6	37.4	48.0	54.0	-6.0	

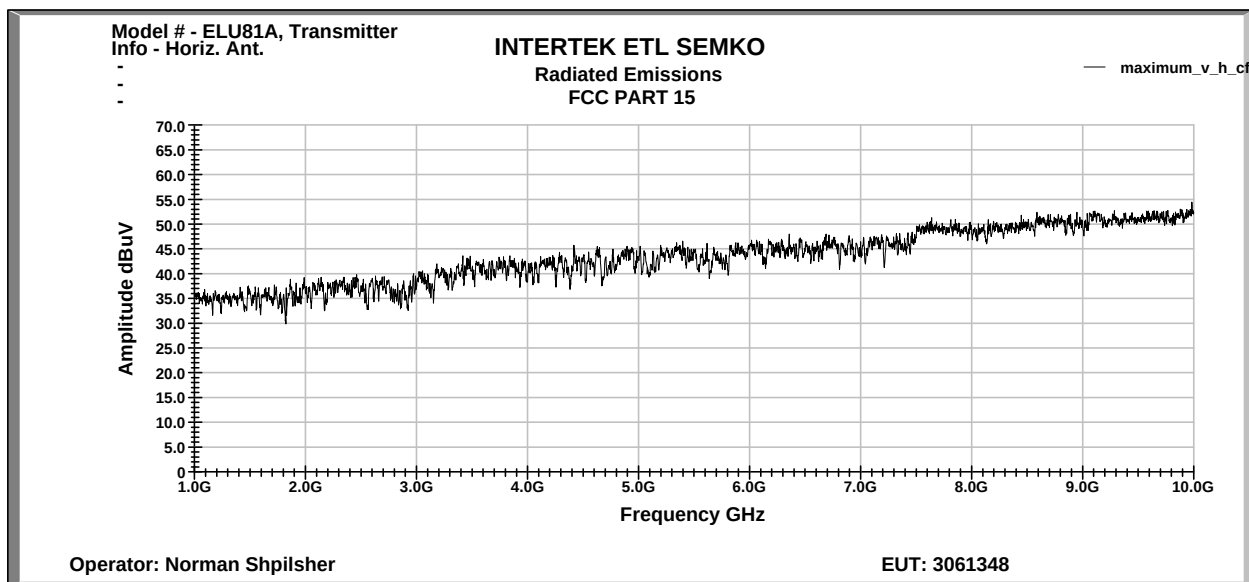
Comments:

Graph # 3-2-1 **Harmonics and Spurious Emissions from 1GHz to 10GHz**

Vertical Antenna Polarization



Horizontal Antenna Polarization



3.3 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the direct Field Strength Calculation is shown in Section 3.7.

Conducted Emissions

For conducted emissions testing, the equipment is moved to an insulating platform over the ground plane, and the EUT is powered from a LISN. Both sides of the AC line are measured and the results are compared to the applicable limits. Measurements are taken using CISPR quasi-peak and average detectors when the peak readings approach or exceed the average limit. Only quasi-peak readings are taken when the emissions from the EUT meet the average limit as measured with the quasi-peak detector.

3.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dB}$$

$$FS = RA + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Norman Shpilsher
Sr. EMC Engineer
Intertek ETL SEMKO

Signature

A handwritten signature in black ink, reading "Norman Shpilsher", written over a horizontal line.

Date: July 14, 2004

4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers and Test Software

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	08/03	08/04	X
HP85460A RF Filter Section	3330A00109	08/03	08/04	X
HP85462A Receiver RF Section	3549A00306	01/04	01/05	
HP85460A RF Filter Section	3448A00276	01/04	01/05	
Advantest Spectrum Analyzer R3271A	55050084	06/04	06/05	X
TILE! Instrument Control System	ver. 3.2 X	N/A	N/A	X

Antennas

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	01/04	01/05	X
EMCO Horn Antenna 3115	9507-4513	12/03	12/04	
EMCO Horn Antenna 3115	6579	01/04	01/05	X

Artificial Mains Networks/Absorbing Clamps

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
FCC LISN-2	316	01/04	01/05	