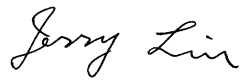
EMC
TEST REPORT

Report No. : EME-030687
Model No. : EL-431
Issued Date : Sep. 2, 2003

Applicant : E-LEAD ELECTRONIC CO., LTD
No. 37, Gungdung 1st Rd., Shengang Shiang, Changhua, 509, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan

Project Engineer



Jerry Liu

Reviewed By

Elton Chen

Table of Contents

Summary of Tests

FM Music Transmitter -Model: EL-431
FCC ID: QYKEL431A

Test	Reference	Results
Bandwidth of fundamental frequency	15.239(a)	Complies
Field strength of fundamental frequency	15.239(b)	Complies
Radiated emission	15.239(c), 15.209	Complies

1. General information

1.1 Identification of the EUT

Applicant	: E-LEAD ELECTRONICS CO., LTD
Product	: FM Music Transmitter
Model No.	: EL-431
FCC ID.	: QYKEL431A
Frequency Range	: 88.4MHz±0.2MHz
Channel Number	: 1
Frequency of Each Channel	: N/A
Type of Modulation	: FM
Power Supply	: 12Vdc~16Vdc
Power Cord	: N/A
Sample Received	: Jun. 24, 2003
Test Date(s)	: Jun. 24, 2003 ~ Aug. 21, 2003

1.2 Additional information about the EUT

The EUT is a launched wirelessly, the voice and music signal would be received and output by the stereo system.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 2dBi
Antenna Type : PCB Printed
Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
USB PEN	E-Lead	EL-430	N/A	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.239.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

Plug the peripheral EL-430 into the USB port of EUT and then power on the EUT via a 12Vdc battery. (The USB port only supply 5Vdc)
The 1kHz signal will send to EUT via audio cable then the signal will be transmitted from EUT.
There are two testing configurations had been performed, and the worst emissions have been recorded on this report. The configurations are shown below:

Set 1

Set2

The EUT was continuously transmit during the test.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	Feb. 18, 2003
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 10, 2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2003
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2002
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3133	Feb. 21, 2003
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A

Note:
1. The calibration interval of the above instruments is 12 months.

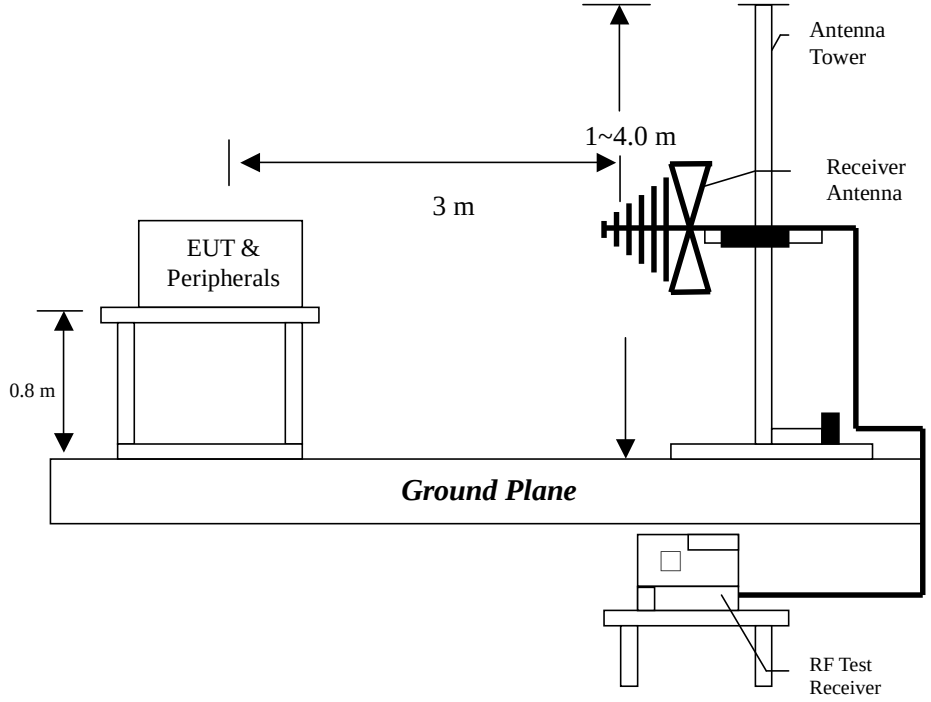
3. Radiated emission test FCC 15.239 (b)/(c)

3.1 Operating environment

Temperature:	24	℃	(10-40℃)
Relative Humidity:	47	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental	
	(uV/m@3m)	(dBuV/m@3m)
88-108	250	48

The emission limit above is based on measurement instrumentation employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

3.3.2 General radiated emission limits

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is ±4.98 dB.

3.4 Radiated emission test data

The radiated emissions at

Frequency(MHz)	Margin
215.900	-3.20
287.900	-3.00
35.980	-2.60

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : EL-431
Worst Case Condition : set2

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Calculated Level (dBuV/m)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)	Remark
88.400	PK	V	9.41	38.02	47.43	48.00	-0.57	152.00	247.00	set2
35.980	QP	V	12.70	24.70	37.40	40.00	-2.60	100.00	100.00	set2
168.000	QP	V	14.50	19.70	34.20	43.50	-9.30	308.00	308.00	set2
265.300	QP	V	13.50	26.90	40.40	46.00	-5.60	174.00	174.00	set2
287.900	QP	V	14.40	25.80	40.20	46.00	-5.80	184.00	184.00	set2

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

The radiated emissions at

Frequency(MHz)	Margin
215.990	-3.10
265.360	-3.50
287.990	-3.60
263.900	-4.54

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : EL-431
Worst Case Condition : set2

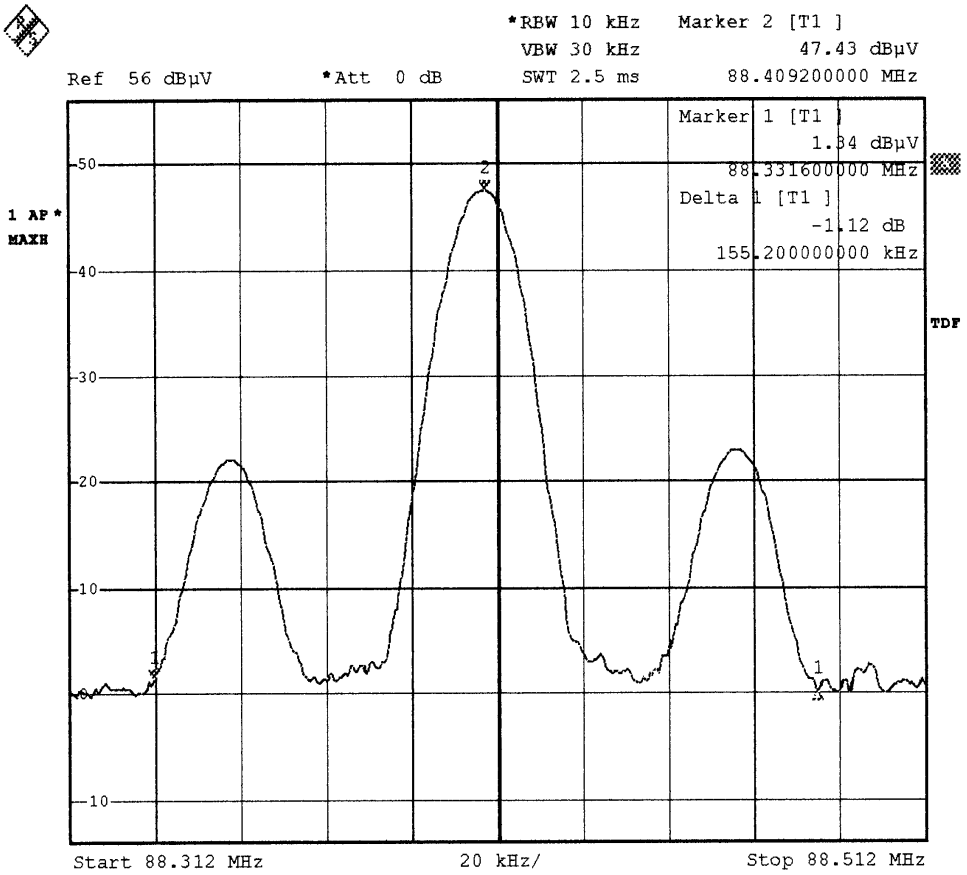
Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Calculated Level (dBuV/m)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)	Remark
88.4000	PK	H	9.41	37.57	46.98	48.00	-1.02	211.00	256.00	set2
197.990	QP	H	12.00	21.20	33.20	43.50	-10.30	132.00	235.00	set2
215.900	QP	H	11.70	26.83	38.53	43.50	-4.97	154.00	132.00	set2
263.900	QP	H	13.50	27.96	41.46	46.00	-4.54	100.00	240.00	set2
288.010	QP	H	14.40	24.25	38.65	46.00	-7.35	102.00	132.00	set2

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

4. Bandwidth of fundamental frequency FCC 15.239(a)

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operation frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

Please see the plot below.



Comment A: Channel bandwidth