

# INTERTEK TESTING SERVICES

## MEASUREMENT/TECHNICAL REPORT

**Lelux Electronics Ltd. - MODEL: Lelux 661**  
**FCC ID: NS3661R**

This report concerns (check one:)      Original Grant       Class II Change

Equipment Type: Superregenerative Receiver (example: computer, printer, modem, etc.)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes       No

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_  
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart B for unintentional radiator - the new 47 CFR [10-1-96 Edition] provision.

Report prepared by:

C. K. Lam  
Intertek Testing Services  
Hong Kong Ltd.  
2/F., Garment Centre,  
576, Castle Peak Road,  
Kowloon, Hong Kong  
Phone: 852-746-8211  
Fax: 852-785-5487

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**EXHIBIT 1**

**GENERAL DESCRIPTION**

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### 1.3 Test Methodology

The radiated emission measurements was performed according to the procedures in ANSI C63.4 (1992). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All 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 open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

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**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

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### 2.0 System Test Configuration

#### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (1992).

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The device was powered from three AA size batteries.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a cardboard box, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

#### 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it received continuously.

#### 2.3 Support Equipment List and Description

This product was tested in standalone configuration.

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### 2.4 Equipment Modification

Any modifications installed previous to testing by Lelux Electronics Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

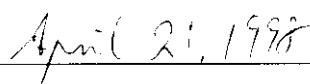
### 2.5 Special Accessories

There are no special accessories necessary for compliance of this product.

*Confirmed by:*

*C. K. Lam*  
*Assistant Manager - EMC*  
*Intertek Testing Services*  
*Hong Kong Ltd.*  
*Agent for Lelux Electronics Ltd.*

  
\_\_\_\_\_  
Signature

  
\_\_\_\_\_  
Date

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**EXHIBIT 3**

**EMISSION RESULTS**

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### 3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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### 3.1 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 reading. The basic equation with a sample calculation is as follows:

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

where FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in  $\text{dB}\mu\text{V}$

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$

RR = RA - AG in  $\text{dB}\mu\text{V}$

LF = CF + AF in dB

Assume a receiver reading of 52.0  $\text{dB}\mu\text{V}$  is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32  $\text{dB}\mu\text{V}/\text{m}$ . This value in  $\text{dB}\mu\text{V}/\text{m}$  was converted to its corresponding level in  $\mu\text{V}/\text{m}$ .

$$RA = 52.0 \text{ dB}\mu\text{V}/\text{m}$$

$$AF = 7.4 \text{ dB}$$

$$RR = 23.0 \text{ dB}\mu\text{V}$$

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

$$LF = 9.0 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V}/\text{m}$$

$$\text{Level in mV/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$$

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### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 3.5 dB

\*All readings are peak unless stated otherwise

### **TEST PERSONNEL:**

K. Lam  
Signature

Kenneth H. M. Lam, Compliance Engineer  
Typed/Printed Name

April 21, 1998  
Date

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Company: Lelux Electronics Ltd.  
Model: Lelux 661

Date of Test: April 7, 1998

**Table 1**  
**FCC Class B Radiated Emissions**

Polarity	Frequency (MHz)	Reading (dB $\mu$ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	296.258	29.4	22	16	35.4	46	-10.6
H	297.416	30.6	22	16	36.6	46	-9.4
H	298.704	32.0	22	16	38.0	46	-8.0
H	299.984	35.1	22	16	41.1	46	-4.9
H	301.224	35.2	22	16	41.2	46	-4.8
H	302.476	36.3	22	16	42.3	46	-3.7
H	303.722	36.5	22	16	42.5	46	-3.5
H	304.532	35.9	22	16	41.9	46	-4.1
H	305.354	34.0	23	16	41.0	46	-5.0
H	306.614	28.3	23	16	35.3	46	-10.7
H	307.755	27.1	23	16	34.1	46	-11.9
H	308.963	27.2	23	16	34.2	46	-11.8
H	310.140	27.3	23	16	34.3	46	-11.7
H	311.306	26.7	23	16	33.7	46	-12.3

NOTES: 1. Negative sign in the column shows value below limit.  
2. Peak Detector Data.  
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

Test Engineer: Kenneth H. M. Lam

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**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

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### 8.0 Miscellaneous Information

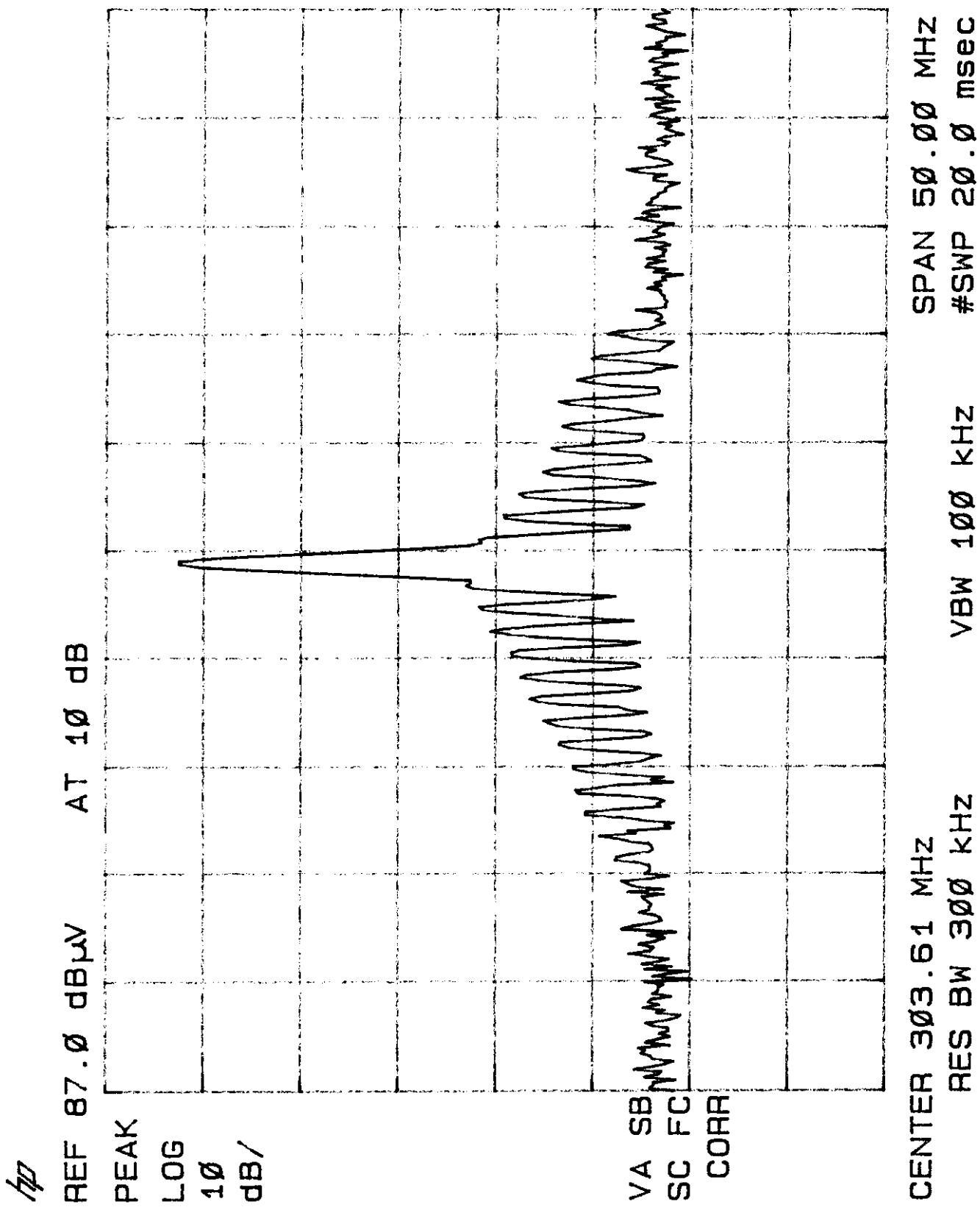
This miscellaneous information includes details of the stabilizing process (including a plot of the stabilized waveform), the test procedure and calculation of factors such as pulse desensitization and averaging factor.

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### **8.1 Stabilization Waveform**

Previous to the testing, the superregenerative receiver was stabilized as outlined in the test procedure. The plot on the following page shows the fundamental emission when a signal generator was used to stabilize the receiver. Please note that the antenna was placed as close as possible to the EUT for clear demonstration of the waveform and that accurate readings are not possible from this plot.



10

FCCID: NS3661R

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### 8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

This device is a superregenerative receiver. The stabilized signals are continuous, and no desensitization of the measurement equipment occurs.

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### 8.3 Calculation of Average Factor

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

This device is a superregenerative receiver.

It is not necessary to apply average factor to the measurement results.

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### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of superregenerative receivers operating under the Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992. Superregenerative receivers are stabilized prior to measurement by generating a signal well above the receiver threshold whose frequency is tuned until the emissions stabilize into a line spectrum. The signal is usually generated as CW with a Marconi 2022D signal generator and a short whip antenna and is at a level of several hundred to several thousand mV/m. Plots of the stabilized signal will be shown. If a modulated signal is used, it will be noted.

The equipment under test (EUT) is attached to a cardboard box and placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 kHz to 30 MHz.

## INTERTEK TESTING SERVICES

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### 8.4 Emissions Test Procedures (cont)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 1992.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.