

TEST REPORT

Report No.: HK12080812-1

King's Manufacturing Co., Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: P3L-NEXA-3-2012)

Superregenerative Receiver

Prepared and Checked by:

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Signed On File
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Date: September 06, 2012

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GENERAL INFORMATION

King's Manufacturing Co., Ltd.
BRAND NAME: NEXA, MODEL: KR5521A

FCC ID: P3L-NEXA-3-2012

Grantee:	King's Manufacturing Co., Ltd.
Grantee Address:	Room 1004, Peninsula Square, 18 Sung On Street, Hung Hom, Kowloon, Hong Kong.
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Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	NEXA
Model:	KR5521A
Type of EUT:	Superregenerative Receiver
Description of EUT:	Weather Station Radio with Wireless In/Out Thermometer
Serial Number:	N/A
FCC ID:	P3L-NEXA-3-2012
Date of Sample Submitted:	August 16, 2012
Date of Test:	August 31, 2012
Report No.:	HK12080812-1
Report Date:	September 06, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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SUMMARY OF TEST RESULT

King's Manufacturing Co., Ltd.
BRAND NAME: NEXA, MODEL: KR5521A

FCC ID: P3L-NEXA-3-2012

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Antenna Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
RF Exposure Compliance	15.247(i) / RSS-Gen 5.6	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.4	N/A
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	N/A
Transmitter Field Strength and Bandwidth Requirement	15.235 / RSS-310 3.9	N/A
Receiver Radiated Emissions	15.109 / RSS-Gen 6.1	Pass
Receiver Conducted Emissions	15.107 / RSS-Gen 7.2.4	Pass

- Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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1.0 **General Description**

1.1 Product Description

The equipment under test (EUT) is a weather station with wireless thermometer operating at 433.92MHz. The EUT is powered by 7.5VDC (5 x 1.5V "AAA" batteries) or 120VAC. The EUT will receive RF signal from the corresponding transmitter (weather scanner) and will display the humidity and temperature on the screen. Also, the EUT has an AM/FM radio function and Line-in function.

Antenna Type : Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

The transmitter (with FCC ID: P3L-NEXA2012) for this receiver (with FCC ID: P3L-NEXA-3-2012) has been authorized by Certification procedure.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). 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. 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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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 (2009).

The device was powered by 5 x new 1.5V "AAA" batteries and/or 120VAC 60Hz.

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 rear of unit shall be flushed with the rear of the table.

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 plastic stand if necessary and placed on the wooden turntable, 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 receives the RF signal continuously.

2.3 Special Accessories

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

2.4 Equipment Modification

Any modifications installed previous to testing by King's Manufacturing Co., Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

N/A.

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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.

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), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

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

where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- AV = Average Factor 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 dB μ V/m
- RR = RA - AG - AV in dB μ V
- LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ 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 and average factor of 5 dB are subtracted, giving a field strength of 27 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

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

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

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

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

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

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 430.630 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

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.

Judgment: Passed by 3.8 dB

3.4 Conducted Emission Configuration Photograph

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by more than 20 dB

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Applicant: King's Manufacturing Co., Ltd.
Model: KR5521A
Worst-Case Operating Mode: Receiving

Date of Test: August 31, 2012

Table 1

Radiated Emissions
Pursuant to FCC Part 15 Section 15.109 Requirement

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
H	426.600	31.0	16	25.0	40.0	46.0	-6.0
H	428.600	32.1	16	25.0	41.1	46.0	-4.9
H	430.630	33.2	16	25.0	42.2	46.0	-3.8
H	432.830	32.4	16	25.0	41.4	46.0	-4.6
H	434.980	31.8	16	25.0	40.8	46.0	-5.2
H	437.230	29.5	16	26.0	39.5	46.0	-6.5
H	862.001	16.8	16	31.0	31.8	46.0	-14.2
H	863.360	18.4	16	31.0	33.4	46.0	-12.6
H	865.008	17.1	16	31.0	32.1	46.0	-13.9
H	1290.004	40.4	33	26.1	33.5	54.0	-20.5
H	1292.340	41.5	33	26.1	34.6	54.0	-19.4
H	1294.650	39.9	33	26.1	33.0	54.0	-21.0

NOTES: 1. Peak Detector Data unless otherwise stated.

2. 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.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.

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4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

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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 the factors such as pulse desensitization and averaging factor.

8.1 Stabilization Waveform

Previous to the testing, the superregenerative receiver was stabilized as outlined in the test procedure. For the electronic filing, the plot saved with filename: superreg.pdf show 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.

8.2 Discussion Pulse Desensitivity

This device is a superregenerative receiver. No desensitization of the measurement equipment is required as the received signals are continuously.

8.3 Calculation of Average Factor

This device is a superregenerative receiver. It is not necessary to apply average factor to the measurement result.

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 (2009). A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. 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 EUT 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 150 kHz to 30 MHz.

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8.4 Emissions Test Procedures (cont'd)

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 (2009).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is 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 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

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9.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-2500	EW-2512	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Feb. 24, 2012	Nov. 15, 2011	Oct. 31, 2011
Calibration Due Date	Feb. 24, 2013	May 15, 2013	Apr. 30, 2013

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2188	EW-1133
Manufacturer	AGILENTTECH	EMCO
Model No.	E4407B	3115
Calibration Date	Sep. 26, 2011	Mar. 02, 2011
Calibration Due Date	Sep. 26, 2012	Sep. 02, 2012

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN	Pulse Limiter
Registration No.	EW-2500	EW-0192	EW-0698
Manufacturer	R&S	R&S	R&S
Model No.	ESCI	ESH3-Z5	ESH3-Z2
Calibration Date	Feb. 24, 2012	Apr. 11, 2012	Apr. 06, 2012
Calibration Due Date	Feb. 24, 2013	Apr. 11, 2013	Apr. 06, 2013

3) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-1792
Manufacturer	R&S
Model No.	FSP40
Calibration Date	Sep. 28, 2011
Calibration Due Date	Sep. 28, 2012