74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 Korea
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC / ISED REPORT

Class II Permissive Change

Applicant Name:
Kenwood USA Corporation

Address:
1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa,
226-8525 JAPAN

Date of Issue:
July 19, 2018
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-1807-FI006

ISED Registration Number : 5944A-6

FCC ID:	**ALH442000**
ISED:	**282D-442000**
APPLICANT:	**Kenwood USA Corporation**

FCC Model(s):	NX-5400-K2, NX-5400-K3, NX-5400-F2, NX-5400-F3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
ISED Model(s):	NX-5400-K2, NX-5400-K3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
EUT Type:	700/800MHZ DIGITAL TRANSCEIVER
Frequency Range:	FCC : 769-775, 799-805, 806-824, 851-869 MHz ISED : 768-776, 798 - 806, 806 – 824, 851-869 MHz
FCC Rule Part:	Part 90
ISED Rule:	RSS-Gen Issue 5(April 2018), RSS-119 Issue 12

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by : Kwon Jeong
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1807-FI006	July 19, 2018	- First Approval Report

Table of Contents

1. GENERAL INFORMATION

Manufacturer:	Kenwood USA Corporation
Address:	3-12, Moriyacho, Kanagawa-ku, Yokohama-shi, Knagawa, 221-0022 JAPAN
FCC ID:	ALH442000
ISED:	282D-442000
EUT Type:	700/800MHZ DIGITAL TRANSCEIVER
FCC Model name(s):	NX-5400-K2, NX-5400-K3, NX-5400-F2, NX-5400-F3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
ISED Model name(s):	NX-5400-K2, NX-5400-K3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
Date(s) of Tests:	July 02, 2018 ~ July 11, 2018
Place of Tests:	HCT Co., Ltd. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Korea

2. EUT DESCRIPTION

EUT Type	700/800MHZ DIGITAL TRANSCEIVER
FCC Model Name	NX-5400-K2, NX-5400-K3, NX-5400-F2, NX-5400-F3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
ISED Model Name	NX-5400-K2, NX-5400-K3, TK-5430-F2, TK-5430-F3, VP5430-F2, VP5430-F3, VP6430-F2, VP6430-F3
Power Supply	DC 7.5 V
Output Power	3 W (Power output continuously variable to 1 W)
Battery type	Li-ion Battery (KNB-L1, KNB-L2, KNB-L3, KNB-LS7)
Channel Bandwidth	FCC/ ISED : 25kHz, 12.5 kHz, 6.25kHz
Operating Temperature	-30 ℃ ~ +60 ℃
Frequency Range	FCC : 769-775, 799-805, 806-824, 851-869 MHz ISED : 768-776, 798 - 806, 806 – 824, 851-869 MHz
Test Frequency	FCC : 769.05 MHz, 815.05 MHz, 868.95 MHz ISED : 768.05 MHz

3. TEST METHODOLOGY

TIA-603-E dated March, 2016 entitled “Land Mobile FM or PM Communications Equipment Measurement and Performance Standards” were used in the measurement.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the FCC Rules Part 2 and Part 90.

3.3 GENERAL TEST PROCEDURES

Radiated Emissions

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-E-2016 Clause 2.2.17. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a positive peak detector.

A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting is programmed.

3.5 Type of Emission

16K0F3E	(Analogue)
14K0F3E	(Analogue)
11K0F3E	(Analogue)
8K10F1E, 8K10F1D	(P25 phase1)
8K10F1W	(P25 phase 2, TDMA)
8K30F1E, 8K30F1D, 8K30F7W	(NXDN)
7K60FXD, 7K60FXE	(DMR)
4K00F1E, 4K00F1D, 4K00F7W	(NXDN)
4K00F2D	(CWID)

4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea**.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

6. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	ISED Part Section(s)	Test Limit	Test Result
Field Strength of Spurious Radiation	§2.1051, §2.1053, §2.1057, §90.210	RSS119-i12(5.8)	Varies	PASS
Receiver Spurious Emissions	-	RSS-Gen(7)	cf. Section 7.2	PASS

7. TEST RESULT

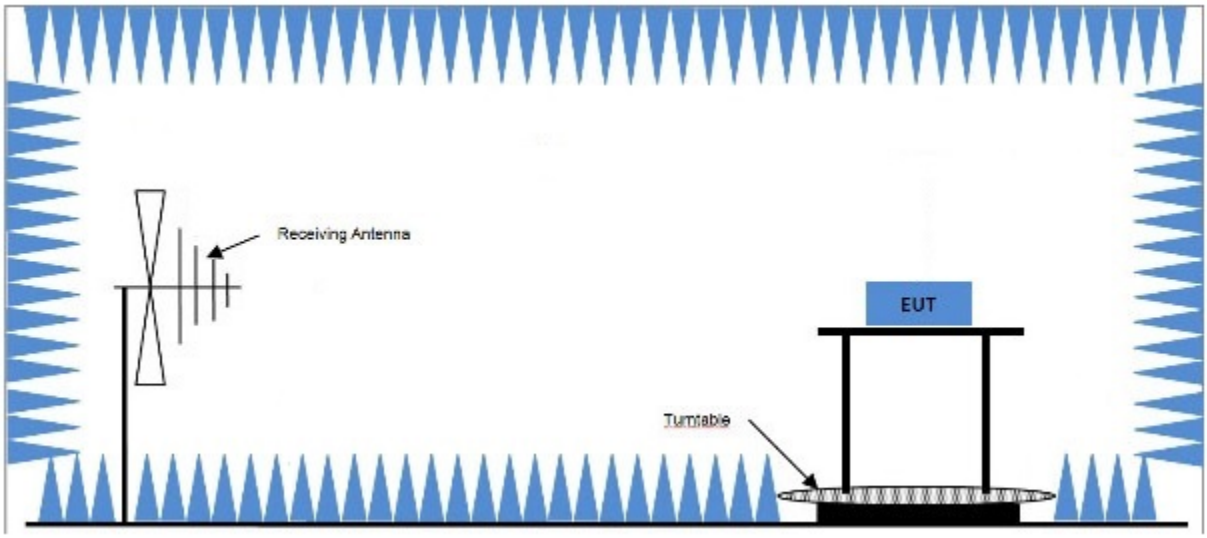
7.1 Unwanted Emissions : Radiated Spurious Emission

▣ Definition

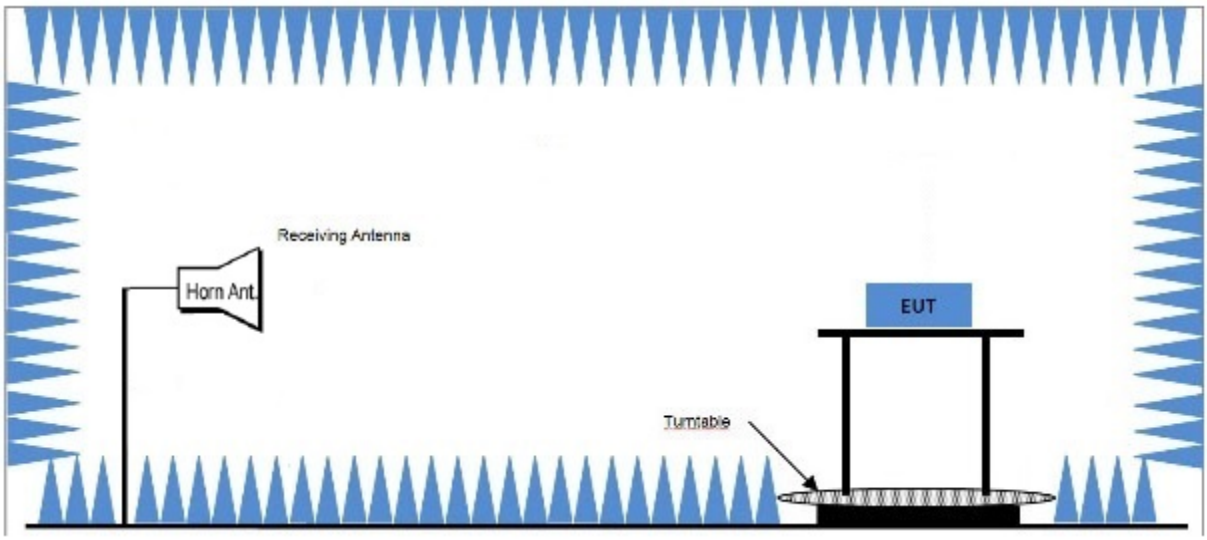
Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

▣ TEST CONFIGURATION

Below 1 GHz



Above 1 GHz



TEST PROCEDURE USED

a) Connect the equipment as illustrated.

b) Adjust the spectrum analyzer for the following settings:

1) Resolution Bandwidth = 10 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.

2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.

3) Sweep Speed slow enough to maintain measurement calibration.

4) Detector Mode = Positive Peak.

c) Place the transmitter to be tested on the turntable in the standard test site, or an FCC listed site compliant with ANSI C63.4-2001 clause 5.4. The transmitter is transmitting into a nonradiating load that is placed on the turntable. The RF cable to this load should be of minimum length. For transmitters with integral antennas, the tests are to be run with the unit operating into the integral antenna.

d) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ± the test bandwidth (see 1.3.4.4).

e) Key the transmitter.

f) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable should be rotated 360°to determine the maximum reading.
Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

g) Repeat step f) for each spurious frequency with the test antenna polarized vertically.

h) Reconnect the equipment as illustrated.

i) Keep the spectrum analyzer adjusted as in step b).

j) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

k) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

l) Repeat step k) with both antennas vertically polarized for each spurious frequency.

m) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

Pd(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:

Pd is the dipole equivalent power and

Pg is the generator output power into the substitution antenna.

n) The *Pd* levels record in step m) are the absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions (dB) =

$10*\log_{10}$(TX power in watts/0.001)- *the levels in step m)*

▣ Operating Mode

EUT Type (Worst case)	Modulation (Worst case)	Battery	Test frequency (MHz)
Stand alone	16K0F3E 11K0F3E 4K00F1E, 4K00F1D, 4K00F7W	KNB-LS7	768.05 (ISED)
			769.05 (FCC/ ISED)
			815.05 (FCC/ ISED)
			868.95 (FCC/ ISED)

Note:

All modes of operation were investigated and the worst case configuration results are reported.

▣ TEST RESULTS

Type of Emission : 16K0F3E

Frequency : 768.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1536.10	-32.83	-4.35	Z-H	-37.18	-13.00	24.18
2304.15	-35.69	1.21	Z-H	-34.48	-13.00	21.48
6912.45	-54.10	14.13	Z-H	-39.97	-13.00	26.97

Frequency : 769.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1538.10	-32.94	-4.35	Z-H	-37.29	-13.00	24.29
2307.15	-38.52	1.21	Z-H	-37.31	-13.00	24.31
6921.45	-53.09	14.13	Z-H	-38.96	-13.00	25.96

Frequency : 815.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1630.10	-32.52	-4.99	Z-H	-37.51	-13.00	24.51
2445.15	-37.55	0.24	Z-H	-37.31	-13.00	24.31
6520.40	-45.23	13.27	Z-H	-31.96	-13.00	18.96

Frequency : 868.95
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1737.90	-30.05	-4.88	Z-H	-34.93	-13.00	21.93
2606.85	-50.48	0.55	Z-H	-49.93	-13.00	36.93
3475.80	-48.71	3.38	Z-H	-45.33	-13.00	32.33
5213.70	-55.26	10.22	Z-H	-45.04	-13.00	32.04
6082.65	-55.71	12.02	Z-H	-43.69	-13.00	30.69
6951.60	-53.32	14.23	Z-H	-39.09	-13.00	26.09

Type of Emission : 11K0F3E

Frequency : 768.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1536.10	-33.53	-4.35	Z-H	-37.88	-20.00	17.88
2304.15	-39.42	1.21	Z-H	-38.21	-20.00	18.21
6912.45	-54.19	14.13	Z-H	-40.06	-20.00	20.06

Frequency : 769.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1538.10	-33.92	-4.35	Z-H	-38.27	-20.00	18.27
2307.15	-37.23	1.21	Z-H	-36.02	-20.00	16.02
6921.45	-53.97	14.13	Z-H	-39.84	-20.00	19.84

Frequency : 815.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1630.10	-32.82	-4.99	Z-H	-37.81	-20.00	17.81
2445.15	-36.99	0.24	Z-H	-36.75	-20.00	16.75
6520.40	-43.21	13.27	Z-H	-29.94	-20.00	9.94

Frequency : 868.95
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1737.90	-29.88	-4.88	Z-H	-34.76	-20.00	14.76
2606.85	-49.81	0.55	Z-H	-49.26	-20.00	29.26
3475.80	-48.51	3.38	Z-H	-45.13	-20.00	25.13
6951.60	-53.65	14.23	Z-H	-39.42	-20.00	19.42

Type of Emission : 4K00F1E, 4K00F1D, 4K00F7W

Frequency : 768.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
812.30	-82.19	32.662	Z-H	-49.53	-20.00	29.53
1536.10	-32.83	-4.35	Z-H	-37.18	-25.00	12.18
2304.15	-35.77	1.21	Z-H	-34.56	-25.00	9.56
6912.45	-54.38	14.13	Z-H	-40.25	-25.00	15.25

Frequency : 769.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1538.10	-33.31	-4.35	Z-H	-37.66	-25.00	12.66
2307.15	-35.31	1.21	Z-H	-34.10	-25.00	9.10
6921.45	-54.58	14.13	Z-H	-40.45	-25.00	15.45

Frequency : 815.05
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1630.10	-32.16	-4.99	Z-H	-37.15	-25.00	12.15
2445.15	-36.43	0.24	Z-H	-36.19	-25.00	11.19
6520.40	-44.36	13.27	Z-H	-31.09	-25.00	6.09

Frequency : 868.95
Battery : KNB-LS7

Freq(MHz)	Reading[dBm]	Factor(dBm)	Pol	Result(dB)	Limit(dB)	Margin(dB)
1737.90	-30.17	-4.88	Z-H	-35.05	-25.00	10.05
2606.85	-49.95	0.55	Z-H	-49.40	-25.00	24.40
3475.80	-50.33	3.38	Z-H	-46.95	-25.00	21.95
6951.60	-53.77	14.23	Z-H	-39.54	-25.00	14.54

7.2 Unwanted Emissions : Receiver Radiated Spurious Emission

■ ISED Rule(s) : RSS-GEN

■ Test Requirements : Blow the table

■ Method of testing : Radiated

■ S/A. Settings:

Frequency < 1 GHz : RBW 120 kHz, VBW 300 kHz (Quasi Peak)

Frequency > 1 GHz : RBW 1 MHz, VBW 1 MHz (Peak)

■ Mode of operation : Receive

■ Limit :

Frequency (MHz)	Field Strength (microvolts/m at 3 meters)
30 – 88	100
88 - 216	150
216 – 960	200
Above 960	500

▣ TEST RESULTS

Frequency Range : 30 MHz ~ 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Above 1 GHz

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

8. LIST OF TEST EQUIPMENT

8.1 LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
CERNEX	CBLU1183540B-01/ POWER AMP	26822	Annual	2019-06-14
Wainwright	WHKX 10-900-1000-15000-40SS/H.P.F	5	Annual	2018-07-21
Schwarzbeck	BBHA 9120D/ Horn Antenna	9120D-1298	Biennial	2018-10-14
REOHDE&SCHWARZ	FSV40-N/Signal Analyzer	101068-SZ	Annual	2018-09-27
Schwarzbeck	VULB9160/ Bilog Antenna	3368	Biennial	2018-10-14
Agilent	8498A / Attenuator(30 dB)	51162	Annual	2019-02-19
narda	termination	-	-	-

9. APPENDIX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1807-FI006-P